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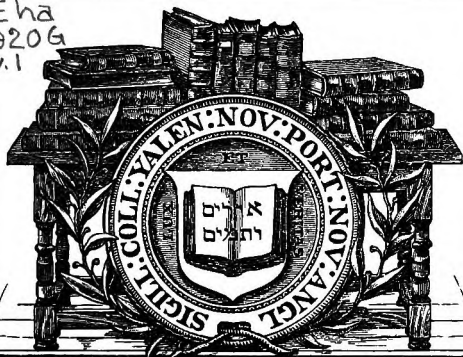


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I.D. 1205

A HANDBOOK OF MEXICO

(I.D. 1205A is a case of maps to accompany this volume)

*Prepared by the Geographical Section of the Naval
Intelligence Division, Naval Staff, Admiralty*

Gt. Brit. Admiralty



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NOTE

IN the later years of the Diaz régime various more or less important topographical and other works were published in Mexico (apart from the extensive literature on the country in English and other languages), and information of that period, for the purposes of this Handbook, is on the whole not unsatisfactory. But the general condition of the country since 1911 has made it difficult in many directions (if not actually impossible) to obtain reliable details since that date, as will be apparent at several points in this Handbook.

The Admiralty will be glad to receive corrections or additions.

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CHAPTER I

DESCRIPTIVE GEOGRAPHY

Situation and area—Boundaries—General description—Coasts—Currents.

SITUATION AND AREA

MEXICO, properly the Republic of Mexico or the United States of Mexico, lies in the narrow southern part of the North American continent between the Gulf of Mexico and the Pacific Ocean, with the United States of America to the north and Guatemala and British Honduras to the south-east.

The total area of Mexico is about 767,000 square miles, but estimates vary a little.

Included in the territory of Mexico, apart from the islands near the coast, are several small islets and reefs in the Gulf of Mexico, Guadalupe Island, off the coast of Lower California, and the Revilla Gigedo Islands about 300 miles west by south of Cape Corrientes. Clipperton or Pasion Island, an uninhabited coral atoll in the Pacific Ocean in lat. $10^{\circ} 17' N.$, long. $109^{\circ} 13' W.$, was taken possession of by Mexico in 1898, though it had previously been recognized as a French possession. The dispute was referred to the arbitration of the King of Italy in 1909.

BOUNDARIES

The international boundaries of Mexico are as follows :

With the United States as fixed by the Guadalupe-Hidalgo treaty of February 2, 1848, the Gadsden treaty of December 30, 1853, the convention of November 12, 1884, and the convention of March 20, 1905. The frontier begins in the Gulf of Mexico three leagues from the land opposite the mouth of the Rio Grande, or opposite the mouth of its deepest branch ; from thence up the middle of that river, following the deepest channel where it has more than one, to the point

where the parallel of $31^{\circ} 47'$ north latitude crosses the same ; thence due west one hundred miles ; thence south to the parallel of $31^{\circ} 20'$ north latitude ; thence along the said parallel of $31^{\circ} 20'$ to the meridian of 111° west of Greenwich ; thence in a straight line to a point on the Colorado River twenty miles below the junction of the Gila and Colorado Rivers ; thence up the middle of the Colorado River to a point on the Colorado River 17 miles in a straight line from the last point ; thence in a straight line to a point on the Pacific Coast, distant one marine league due south of the southernmost point of the port of San Diego. This point is marked by a white marble obelisk, about 20 ft. high, resting on a pedestal, and about 41 ft. above sea-level. The monument stands about 200 yds. from the beach. Its position, as determined by the United States Coast Survey, is lat. $32^{\circ} 31' 58''$ N., long. $117^{\circ} 07' 32''$ W.

The convention of November 12, 1884, had enacted that changes in the course of the Rio Grande should entail no alteration in the course of the boundary. This gave rise to complications owing to the fact that the Rio Grande, which winds much, often shortens its course by cutting a new channel across the neck of a bend and abandoning the old one. The land thus transferred from one side to the other of the river is known as a *banco*. In the stretch of the Rio Grande between its mouth and the confluence of the Rio San Juan 58 of these bancos were surveyed by the International Boundary Commission created in 1889. They are described in the report of the commission, dated June 14, 1898, and shown on 54 maps (scale 1 : 5,000) accompanying that report. A convention, dated March 20, 1905, stipulated that of these 58 bancos those on the right bank of the river should pass to Mexico and those on the left bank to the United States of America. ' Portions of land segregated by the change in the bed ' and having an area of over 250 hectares (617 acres or just under a square mile) and a population of over 200 souls were exempted from this provision. The exemption applies throughout those parts of the Rio Grande and the Colorado

Rivers which serve as a boundary between the two countries. The convention of 1905 further stipulated that this process of elimination should be applied to bancos formed in future as well as to bancos already formed but not surveyed, in both the rivers named. Transference of a banco from one country to another was not to entail transference of titles and rights of citizenship of the inhabitants thereon without their consent. Property in a banco was to be inviolably respected and its present owners or their heirs were to enjoy security with regard to it as if it belonged to the country where it is situated.

The total length of this frontier line from sea to sea is 1,553 miles, if measured along the axis of the Rio Grande without regard to the sinuosities of the river.

With Guatemala as fixed by the treaty of September 27, 1882, and the agreement of April 1, 1895. The line begins in the Pacific Ocean at a point 12 kilometres ($7\frac{1}{2}$ statute miles) from the mouth of the Rio Suchiate and ascends the middle of the deepest channel of that river to that place where the river cuts the vertical plane passing through the summit of Tacana volcano and a point 25 metres (82 ft.) from the most southerly part of Talquian *garita* (guard-house), this *garita* to remain in Guatemalan territory. The line follows the course of the plane so determined from the Rio Suchiate to the summit of Tacana, and continues in a straight line until it meets the line of the vertical plane passing through Buenavista and Ixbul Peaks which it follows to a point 4 kilometres (2.48 statute miles) beyond Ixbul Peak. Thence the line turns east following the latitude of this point till it meets the deepest channel of the Rio Usumacinta, or, if it does not meet that river, the deepest channel of the Rio Chixoy; thence it follows the deepest channel of the Usumacinta, or the Chixoy and the Usumacinta, as the case may be, until it reaches the parallel 25 kilometres ($15\frac{1}{2}$ miles) south of Tenosique in the state of Tabasco, measured from the centre of the *plaza* of that village; thence it follows the parallel so defined till it meets the meridian which passes at a third of the distance between the central points of the *plazas* of the villages of

Tenosique and Sacluc, this third to be reckoned from Tenosique; thence northward along this meridian to lat. $17^{\circ} 49' N.$ and thence eastward along that parallel till it meets the frontier of British Honduras.

The clause giving alternatives between the Usumacinta and the Chixoy is now interpreted in favour of the Chixoy, which in most maps is called the Usumacinta, thus giving Mexico the fullest extent of territory which the treaty allows. The length of the Mexico-Guatemala frontier is 642 miles.

With British Honduras as fixed by the treaty of July 8, 1893, and the convention of April 7, 1897. Beginning at Boca Bacalar Chico, the strait which separates Yucatan from Ambergris Cay and its dependent isles, the boundary line runs in the centre of the channel between the above-mentioned cay and the mainland, south-westward as far as the parallel of $18^{\circ} 9' N.$, and then north-west midway between two cays as far as the parallel of $18^{\circ} 10' N.$; then, turning to the westward, it continues across the adjoining bay first westward to the meridian of $88^{\circ} 2' W.$, then north to the parallel of $18^{\circ} 25' N.$, again westward to the meridian of $88^{\circ} 18' W.$, and northward along that meridian to lat. $18^{\circ} 28' 30'' N.$, in which is situated the mouth of the River Hondo, which it follows in its deepest channel, passing west of Albion Island, continuing up Blue Creek until the said creek crosses the meridian of Garbutt's Falls at a point due north of the point where the boundary lines of Mexico, Guatemala, and British Honduras intersect; and from that point it runs due south to lat. $17^{\circ} 49' N.$, the boundary line between the Republics of Mexico and Guatemala, leaving to the north, in Mexican territory, the so-called River Snosha or Xnohha. The longitude of Garbutt's Falls is reported to be $89^{\circ} 9' 22'' W.$

The following are the areas of the regions lost to Mexico and added to the United States of America at various dates:

By annexation of Texas	.	.	.	.	362,487 square miles
By Guadalupe-Hidalgo Treaty	.	.	.	.	522,568 square miles
By Gadsden Treaty	.	.	.	.	45,535 square miles
					<hr/> 930,590 square miles

GENERAL DESCRIPTION

The greater part of Mexico is a high plateau which extends from the United States frontier to the isthmus of Tehuantepec and is bordered on three sides by high mountain ranges falling away abruptly on the east and west to narrow coastal plains, and on the south to the low isthmus of Tehuantepec. This plateau, with its bordering ranges, occupies fully 50 per cent. of the total area of the country. On its surface are all the principal cities of Mexico except the sea-ports, and it is the home of the chief economic interests of the country excepting the petroleum industry. Access to the plateau from the coastal plains is difficult and presents one of the chief problems in the development of Mexico. In the north the apparently arbitrary boundary with the United States makes a fairly satisfactory frontier, or did so before the era of railways, because of the arid inhospitable lands in that part of the plateau.

The low narrow isthmus of Tehuantepec at the south-eastern end of the plateau separates it from the Chiapas Highlands and Yucatan, two regions which in many respects are more Central American than Mexican in their life and interests. The frontiers against Guatemala and British Honduras are mainly arbitrary lines, but they are so inaccessible, except near the coasts, that their nature is of little account.

The usual division of Mexico into climatic regions (see p. 34) roughly corresponds with the main physical divisions. The *tierra caliente*, or hot country, from sea-level to 3,000 ft., includes the coastal plains, Yucatan, and the lower slopes leading to the plateau. The *tierra templada*, or temperate country, between 3,000 and 6,500 ft., covers all the lower parts of the plateau and the Chiapas Highlands. The *tierra fria*, or cold country, from 6,500 to 12,500 ft., includes the higher parts of the plateau and its bordering ranges. In this zone lie a majority of the chief cities of Mexico.

COASTS

The Atlantic coastline of Mexico has a length of about 1,550 miles. In the south-east the square peninsula of Yucatan projects northward into the Gulf of Mexico, and borders to the west the Gulf of Campeche. The 'Gulf coast', as this coast of Mexico is commonly called, is almost everywhere low. Cliffs are very seldom seen, but they occur in Peñasco Ynan or Kilbride Cliffs, about 3 miles long and 80 ft. high, on the east coast of Yucatan Peninsula nearly opposite the southern end of Cozumel Island, and at Roca Partida, north-west of Puerto Mexico. By far the most common type of coast, on this as on the Pacific side (see below), is that of the low-lying coastal plain, fringed with marshes and lagoons, which are separated from the sea by a narrow spit of sand broken at intervals by shallow channels (*barra*). This type is represented along more than one-half the total length of the Gulf coast—along the north and parts of the west coast of the Yucatan Peninsula, from the Laguna de Terminos and Carmen to within some 40 miles of Puerto Mexico, in the vicinity of Alvarado, and from Punta Delgada (north of Vera Cruz) with few interruptions all the way to the northern frontier at the Rio Grande. Even where lagoons are not present, the coast is still almost invariably low and fronted by an open sandy beach. The lowland behind generally carries more or less dense vegetation. There are no important islands on this coast, except off the eastern shore of Yucatan Peninsula (Cozumel, Mugeris, &c.), nor are reefs numerous close to shore. Off the north and west coasts of Yucatan Peninsula lies the Banco Campeche (Campeche Bank), with water so shallow that the 10-fathom line is about 15 miles (statute) off Cabo Catoche and 18 off Progreso, and the 5-fathom line 12 and 9 miles off the same points respectively. The 100-fathom line reaches an extreme distance of 160 miles off this coast, but from Frontera westward and northward it is never more than 60 miles off shore, and generally much less; it comes within 12 miles of Roca Partida.

The Atlantic coast is bordered from south to north by the territory of Quintana Roo and the states of Yucatan, Campeche, Tabasco, Vera Cruz, and Tamaulipas.

The Pacific Coastline, excluding Lower California, is about 2,200 miles long. The coastline of Lower California is about 1,900 miles long. The coasts of Mexico proper are as a rule low-lying and fringed with shallow lagoons separated from the sea by sand banks and long narrow sandy islands. The coastal waters are generally fairly deep and free from outlying dangers except opposite the river mouths and outlets from the lagoons. This type of coastline is particularly well developed on the east and north of the Gulf of Tehuantepec, around the mouth of the Rio de Balsas, around Manzanilla, and from the mouth of the Rio Grande de Santiago northward to the confines of the Sonora desert. In Oaxaca and Guerrero where the Sierra del Sur reaches the sea and in Jalisco where the Sierra Madre Occidental swings to the west there are stretches of rocky coasts. In Sonora, where desert conditions prevail, extensive sand dunes are common along the coasts. The west coast of Lower California is fringed by lagoons and sand bars in its southern part, but in the northern part it is more rocky though low-lying. The eastern or gulf coast is as a rule steep and rocky.

In the Gulf of California there are a number of small rocky islands, of which the largest are Tiburon, Angel de la Guarda, Carmen, San José, Espiritu Santo, and Cerralbo. On the west coast of Lower California the only important islands are Cedros Island and the outlying Guadalupe Island. The rest of the Pacific coast of Mexico has few islands except the Revilla Gigedo Islands some 300 miles west by south of Cape Corrientes and Las Tres Marias off the mouth of the Rio Grande de Santiago. Both these groups are rocky. The sandy islands referred to above are really part of the coastal plains.

The states which touch the Pacific coast from south to north are Chiapas, Oaxaca, Guerrero, Michoacan, Colima, Jalisco, Nayarit (Tepic), Sinaloa, and Sonora, and the territory of Baja (Lower) California.

Both coasts will be more fully described in Chapter VI.

CURRENTS

Gulf of Mexico.—The currents of the Gulf of Mexico have been investigated in recent years by the United States Hydrographic Office (Publication No. 3,500, July 1915). The principal current, formed by the union of branches of the north and south equatorial currents, enters the Gulf of Mexico between Yucatan and Cuba and turns west across the Campeche bank. It then curves southward across the Gulf of Campeche and approaches the coast in the vicinity of Tampico. Thence it flows north or north-east depending on the season. In late winter it follows the coast almost due north to the vicinity of Matagorda, Texas, where it turns south-east to Florida Strait. At other seasons it flows farther from the coast—being farthest in summer—to about long. 90° W., where it turns south-east, parallel to, but at some distance from the coast of Florida till in the vicinity of the Tortugas Islands it turns east through the Strait of Florida. Between Key West and Cuba it has a speed of about $1\frac{1}{2}$ knots which increases to 3 knots or more at the eastern end of the strait. The current is strongest in April. During September and October, when the trade-winds are blowing strongly, the superficial layers of water are blown in a contrary direction and the easterly set of the current is not apparent on the surface.

Where this current enters the Gulf of Mexico, at the Strait of Yucatan, it sends off two branches, the one about north-north-east to meet the east-flowing stream about the Mississippi mouth, the other east-north-east round the north-west of Cuba to join the stream as it flows eastward through the Strait of Florida.

In addition to the main Gulf stream there are several counter-currents. The Cuba counter-current flows westward along the north coast of Cuba, rounds Cape San Antonio and leaves the Gulf of Mexico along the south coast of Cuba. More important is the west counter-current which is probably a continuation of the Florida counter-current flowing south-

ward along the east coast of Florida. It rounds the Florida Keys and flows north-west into Mobile Bay, and then west towards Galveston, re-enforced to some extent by the waters of the Mississippi. From the vicinity of Galveston this current turns south and follows the coast to about Jerez Point, north of Tampico. There it is either lost in the north-flowing Gulf stream, or in diminished volume continues southward.

The central part of the Gulf of Mexico, above the Sigsbee Deep, has denser and colder waters than the Gulf stream and is little disturbed by horizontal currents. A continuation of strong northers may, however, cause a southerly set of its surface waters. In the north-east of the gulf centring about lat. 27° N. and long. $86^{\circ} 30'$ W. is another but smaller quiet area covering about 5,000 square miles.

Pacific Coast.—The currents on this coast have been little investigated. Along the west coast of Lower California there is a southerly current throughout the year. It is a branch of the westerly drift which crosses the North Pacific Ocean and is diverted south by the coast of America. During the winter this current extends far south along the coast of Mexico but in summer, when southerly winds prevail on that part of the coast, this southern extension is feeble and even reversed. This southern current, when at its greatest development, appears to have a width about 360 miles from Cape Corrientes to the main bight of the west coast of Central America, and there is a counter-current close inshore about 80 miles wide.

In the Gulf of Tehuantepec the currents are chiefly dependent on the local winds. A strong norther tends to blow the water out of the gulf to the southward and so causes currents to flow into the gulf, north-eastward on the west side and north-westward on the east side. When the norther ceases these currents are reversed.

In the Gulf of California the current generally flows slowly to the south-east.

CHAPTER II

PHYSICAL GEOGRAPHY

Surface and relief—Rivers—Lakes—Vegetation—Climate—Earthquakes
—Local time—Magnetic variation—Fauna—Geological formation.

SURFACE AND RELIEF

THE chief physical regions in Mexico are as follows: (1) The Central Plateau, (2) The Sierra Madre Oriental, (3) The Sierra Madre Occidental, (4) The Sierra del Sur, (5) The Atlantic Coastal Plain, (6) The Pacific Coastal Plain, (7) Lower California, (8) The Isthmus of Tehuantepec, (9) Yucatan, (10) The Chiapas Highlands.

(1) *The Central Plateau*, Mesa Central, or Anahuac plateau, as it is variously called, extends from the high plains of Texas, New Mexico, and Arizona, to the isthmus of Tehuantepec, a distance of about 800 miles. In the north its average elevation is 4,000 ft., and in the south 8,000 ft. Termed a plateau rather in virtue of its height than by reason of its uniformity of surface, it originated through débris from ranges parallel to its borders and volcanic matter more or less filling up intervening valleys. This mode of formation explains the surface features, for while in the north the plateau has a fairly even surface, except for isolated ranges rising to 5,000 ft., and occasional peaks of 8,000 ft., in the south and east it is rugged and mountainous, rising to heights of over 10,000 ft. Many large valleys of internal drainage, called Bolsons, lie on its surface, of which the chief are the Bolson of Mapimi, in the north, a rocky and swampy wilderness covering 50,000 sq. miles, and the Valley of Mexico, in the south, 50 miles long by 35 miles wide, in which lie six shallow lakes and many marshes. The great depths of alluvial soil in many of the valleys of the plateau is further evidence of its structural origin.

While volcanic activity seems to be extinct in the northern parts of the plateau, a region in which volcanoes are numerous and still active lies in the southern part and stretches from the Pacific almost to the Atlantic. In this belt, some 550 miles wide, volcanic action is responsible for the chief surface features to a degree unknown elsewhere in Mexico. The average elevation of the volcanic belt is 8,000 ft., but six or more peaks rise 5,000 or 10,000 ft. above this height, including Orizaba, 18,240 ft., on the eastern edge of the plateau, overlooking the Atlantic coastal plain, and its twin peak to the north, Copre de Perote, 13,411 ft. high; Ixtaccihuatl, 15,082 ft., and Popocatepetl, 17,520 ft., both south-east of Mexico City, the latter still emitting steam and smoke; Toluca, 13,000 ft., south-west of Mexico City, and Colima, 12,644 ft., near the western edge of the plateau, active in 1909. In this volcanic region lies the Valley of Mexico, referred to above, and Lake Chapala, the largest lake in the plateau, 80 miles long and 10 to 35 miles wide. This region towers above the narrow coastal plains to east and west. Access from seaports to the interior is short in point of distance, but difficult, and has been achieved only by the exercise of considerable engineering skill.

The escarpments of the plateau are the so-called border ranges or cordilleras. On the east is the Sierra Madre Oriental, on the west the Sierra Madre Occidental, and on the south, between the volcanic region of the plateau and the isthmus of Tehuantepec, the Sierra del Sur.

(2) *The Sierra Madre Oriental* is the eastern edge of the plateau. In the north there is no definite cordillera: a broken chain of low ranges marks the slope of the plateau to the coastal plain, and affords no great obstacle to penetration. South of about lat. 26° N. the mountains increase in height and form a single lofty range, which, from the latitude of Tampico southward, overlooks the coastal plain in a steep escarpment. The mean altitude is over 5,000 ft., and some peaks reach 10,000 ft. or more. The Sierra Madre Oriental has not the same continuity as the Sierra Madre Occidental.

Several rivers cross it in fairly wide valleys, which afford routes between the coast and the interior, notably the valleys of the Rio Grande del Norte and its tributary the Rio Salinas, and the Rio Panuco.

(3) *The Sierra Madre Occidental*, the high western edge of the central plateau, is a fairly continuous chain of narrow, steep ridges and intervening long valleys. The width of this cordillera increases from about 100 miles in the north to about 300 miles in the south, where it is lost in the volcanic belt described above. Its elevation is 5,000 to 7,000 ft. in the north, increasing to about 10,500 ft. about lat. 26° N. Towards the south many spurs run eastward across the plateau, their height to some extent lost by the filling up of the intervening valleys. From the plateau the ascent to this cordillera region is comparatively easy, but from the coastal plains the ascent is steep and difficult except in the north, where, however, desert conditions prevail. The few rivers that breach the cordillera do so in steep-walled cañons and so afford no practical routes. The Sierra Madre Occidental has always acted as a formidable hindrance to east and west traffic.

(4) *The Sierra del Sur* is the southern edge of the plateau linking the Sierra Madre Occidental with the Sierra Madre Oriental. It is a labyrinth of mountain ranges with a general elevation not exceeding 7,000 ft., but with a few peaks, principally in the south, rising to great heights, such as Zempoaltepetl, 11,146 ft., and Cerro del Leone, 10,299 ft., near the Pacific coast. There are no volcanoes among these peaks. The trend of the coast causes this Sierra to overlook the Pacific along its southern edge: the escarpment from the coastal plain is steep and affords no practical route to the interior. On the east the Sierra del Sur ends above the low isthmus of Tehuantepec in a steep escarpment about 8,000 ft. in height. To the north, towards the Atlantic coastal plains, the slope is gentler, and there are several possible routes to the interior.

East and west of the plateau and the Sierras described above lie the low coastal plains which in their scenery,

climate, and economic value show great contrasts with the plateau.

(5) *The Atlantic or Gulf coastal plains* are continuous with the gulf plains of the United States. In the north they are about 200 miles wide. Southward they narrow rapidly to 50 miles or so at Tampico, whence they continue narrow till they widen again at the head of the Gulf of Campeche, and merge into the broad plains of Tabasco and Yucatan (see below). These plains end fairly abruptly in the foothills of the Sierra Madre, but jutting spurs of the mountains may reach almost to the sea, as in the peak of Tuxtla, 4,920 ft. high, north-west of Puerto Mexico. Other spurs are worn down to a level little above that of the plain, and can be recognized only by their rock structure. The plains are crossed by several streams, many of which have navigable stretches to near the foot of the Sierra Madre. The largest and most important of these streams is the Rio Grande del Norte.

(6) *The Pacific coastal plains* are more varied. In the south, along the Sierra del Sur, they are discontinuous, and not more than 30 or 40 miles wide and often less. In many places there is no plain, and spurs of the mountains stand out to sea as bold headlands. In other places the foothills of the mountains rob the fringe of lowland of any resemblance to a plain. North of about lat. 22° N. the plain begins to be more pronounced. The coast diverges from the edge of the plateau till at the head of the Gulf of California it is separated from it by a region 200 miles wide, of which a coastal strip some 70 miles in width is nearly level, with elevations not over 200 ft., and the rest is a region of foothills under 2,000 ft., except for occasional peaks of 5,000 ft. or more.

Rivers are numerous but short and turbulent. North of the Rio Grande de Santiago, as the plains and foothill region widens, they show a tendency to flow from north to south, which divides the foothills into ridges running in the same direction. Although several of these rivers flow for a considerable part of their courses in deep ravines, this arrangement

of surface features results, in Sonora, in easy lines of communication between the Mexican sea-board and the great basin region of Arizona lying north of the United States frontier. The plains where normally developed are fringed by lagoons, marshes, and sandy islands, as on the Atlantic side.

(7) *The peninsula of Lower California* is separated from the mainland of Mexico by the long narrow Gulf of California, at the head of which is a narrow belt of Mexican territory, about 60 miles from north to south, and about 60 to 80 miles wide. This region forms the southern part of the great Cahuilla Valley, most of which lies north of the frontier, and contains the Salton Sea and the Imperial Valley, the latter name being usually applied to all that part of the Salton Valley which lies south of the Salton Sea. It may be regarded as an extension of the Colorado desert. The valley is little above sea-level. It was originally the head of the Gulf of California, which has been filled up by alluvial deposits of the Colorado River. In the vicinity of Volcano Lake there is a little volcanic activity. In times of flood the shallow Laguna Salada or Maguata expands to a large lake covering much of the western half of the valley known as the Pattie basin. The only noteworthy ridge is that of the Cocopa Mountains, which separate the the Colorado Valley or Cahuilla basin proper from the Pattie basin. Adjoining the international frontier there is some agriculture based on irrigation, but most of it is in the part of the Imperial Valley in United States territory. West of the Cocopa Mountains there is said to be good arable land at present entirely unutilized. Communication through the southern part of this region is very difficult except by the Colorado River.

Lower California itself is 800 miles long from the United States frontier to Cabo San Lucas, and from 24 to 165 miles wide. From end to end it is traversed by a mountain range lying nearer to the eastern than to the western coast. To the east the slope is abrupt : to the west nearly everywhere the slope is more gradual, and there are coastal plains 2 to 20 miles in width. The range, which is a continuation of the Coast

Ranges of California, has an average height of 2,000 ft. In the north it reaches 10,135 ft. in Santa Catalina, San Pedro Martir Sierra, or Calamahuc ; towards the south, 5,794 ft. in La Gigantea, and in the extreme south, where the central range meets the sea, over 6,000 ft. Lower California is extremely arid, and practically its sole importance lies in its mineral riches. Exception must, however, be made of the Cape region, from La Paz Bay southward, which is well watered and fertile.

(8) *The isthmus of Tehuantepec* is 125 miles across from sea to sea. The surface consists of low rounded hills with their longer slope to the north and their steeper slope to the south. The watershed is 730 ft. in height at Chivela, 47 miles from the Pacific Ocean.

The narrowness and low altitude of this isthmus made it one of the suggested routes for a ship canal some 50 years ago, when trans-isthmian water communication was being seriously discussed. On account, however, of length, the route lost favour in comparison with Panamá. The Tehuantepec railway crosses the isthmus.

The lowlands of the Tehuantepec isthmus are continued east along the Pacific in the narrow coastal *plain of Soconusco*, 5 to 15 miles wide, and along the Gulf of Mexico in the wide *plain of Tabasco*. The coasts of both these plains have the lagoons and marshes characteristic of the Gulf and Pacific plains further north. The plain of Tabasco is crossed by several navigable streams.

(9) *Yucatan* (applying the name generally to the whole peninsula) is an immense calcareous plain 200 miles wide from west to east. It rises from the coast with a gentle gradient to the low Sierra Alta, which traverses the whole peninsula from Cape Catoche south-westward into Guatemala. The Sierra Alta does not rise above 900 ft. The west and north coasts are low, sandy, and generally fringed by lagoons ; the east coast is more indented, higher, and bordered by several islands. There are no rivers except the Rio Hondo, which forms part of the boundary with British Honduras.

(10) *The Chiapas Highlands* lie between the plain of Tabasco to the north and the plain of Soconusco to the south. They continue into Guatemala and form part of the plateau region of Central America. These highlands rise to an elevation of over 5,000 ft. with a few peaks approaching 8,000 ft. Tacana on the Guatemalan frontier, is a volcano which has been dormant for many years. The slope of the highlands to the south is very steep: to the north it is much gentler, and several rivers, including the Mezcalapa, or Chiapas, and the Usumacinta, flow in wide valleys to the plain of Tabasco and the Gulf of Campeche. These rivers, navigable for part of their courses, and their valleys, afford the only practical routes to the Chiapas Highlands from the rest of Mexico.

RIVERS

Mexico is deficient in large streams. The elevated nature of the country and the narrowness of the coastal plains cause most streams to be interrupted by falls and rapids, and to have only short navigable stretches. The numerous falls increase the value of the streams as sources of water-power (see p. 141), the only serious drawback being the intermittent nature of the flow, especially in the case of the Pacific rivers. Several of the streams are used for irrigation purposes. Other projects of this nature are on foot, particularly in the arid north-west, but their progress has been hampered by the unsettled state of the country.

The *Rio Grande del Norte* or Rio Bravo del Norte, about 1,500 miles in length, is the largest river on the eastern side. It rises in Colorado, U.S.A., and its upper reaches are entirely in United States territory. From El Paso to the Atlantic it forms the boundary between the United States and Mexico. The river winds much and the bed shifts in the lower courses. Long reaches flow in deep ravines, but around El Paso and above Presidio del Norte there are wide valleys. From about 20 miles below Presidio del Norte to Del Rio, about 60 miles above Piedras Negras (Ciudad Porfirio Diaz), the river flows in a succession of cañons. From Del Rio to the sea the gradient

is fairly gentle, but the Rio Grande is not navigable above Roma, about 375 miles from the mouth. It is little used above Matamoros and Brownsville, which lie opposite one another about 70 nautical miles from the sea. At the mouth there is a shifting and dangerous bar with an average depth of 3-5 ft. at low water. The Rio Grande is subject to floods from May to September. The waters are used for irrigation purposes in United States territory, to some extent prejudicing the value of the river to Mexican settlers on the right bank. The chief Mexican tributaries are the *Rio Conchos*, which drains from the north of the high plateau, the *Rio Salado*, and the *Rio Salinas*. The importance of these tributaries, especially the last, lies in the routes their valleys afford. On the other hand their deep valleys hinder cross-communication. Rio Conchos has recently been dammed, and a large lake formed in its middle course, in connexion with the important Boquilla power scheme, of which particulars will be found in Chap. V.

The *Rio Santander* or *Rio Soto la Marina* is nearly 200 miles long. It has a dangerous bar, which recently was reported to have only 6 ft. of water. Within the bar there are 10-13 ft. as far as Soto la Marina, a distance of about 39 miles. The *Rio Panuco* is a considerable stream, on which lies the town of Tampico, 5 miles above its mouth (see Appendix I, Gazetteer of Towns). The river has a bar on which constant dredging can maintain 30 ft. of water, but the river is normally shallow. Stern-wheelers can reach El Higo, 113 nautical miles from the mouth, but most navigation ceases at Panuco, 41 miles above Tampico. The river will carry vessels of 10-ft. draught to Topila and 7-ft. draught to Panuco under normal conditions. Of its tributaries the *Rio Tamesi* is the most important. It joins the Panuco from the north-west within a few miles of its mouth (see Tampico in Gazetteer of Towns, Appendix I). Navigation is not easy, but stern-wheelers can ascend about 75 miles. Other navigable tributaries of the Panuco are the *Rio Tempool* and the *Rio Tamuin*. The lakes of the Valley of Mexico drain to the Rio Panuco via the Rio Tula and other tributaries (see p. 32).

In the state of Vera Cruz there are a number of small rivers, most of which are navigable across the coastal plains. The *Rio Tuxpan* is the largest. It has a difficult bar which normally has 5-6 ft. and only occasionally 7 ft. of water. Above the bar there are 14-18 ft. for about 25 miles. Light craft can ascend further. Tuxpan (see Appendix I, Gazetteer of Towns) lies about 5 miles from the mouth of this river. A canoe channel from about 1 mile above the mouth leads through marshes and lagoons to Tampico. The *Rio Nautla* and the *Rio Tecolutla* (San Pablo or Papantla) are navigable for light craft to the foot of the Sierra. Several streams empty into the Laguna de Alvarado in the south-west of the Gulf of Campeche. The chief one is the *Rio Papaloapan*, which is navigable for light-draught vessels to Tuxtepec, 102 miles. Of its tributaries the *Rio Tesechoacan* is navigable to Playa Vicente, 57 miles, and the *Rio San Juan* to San Juan Evangelista, 136 miles, and even farther during the wet season. A river of some importance is the *Rio Coatzacoalcos*, at the mouth of which is Puerto Mexico (see Appendix I, Gazetteer of Towns). The lower reaches are fairly deep, and as far as Minatitlan, 20 miles from the mouth, there are at least 18 ft. of water with 4 ft. more after rains. Stern-wheelers can ascend for another 56 miles. A tributary from the south-east, the *Rio Uspanapa*, is navigable for river steamers to Cascajal, a distance of about 50 miles.

In Tabasco there are many rivers¹ which rise in the Chiapas Highlands, and owing to the heavy rainfall at their sources and the width of the gulf plains, have long stretches suitable for navigation. All, however, are shallow. The *Rio Tonala*, which forms the frontier between the states of Tabasco and Vera Cruz, is navigable for a few miles by small craft. It has a bar with 8-10 ft. of water. The main stream is the *Rio Grijalva*, of which most of the others are tributaries or distributaries. The Grijalva has a changeable bar with a depth of 8-12 ft., but at times only 5-6 ft. To avoid this bar and admit vessels to Frontera, a canal $1\frac{1}{4}$ mile long has been dug

¹ Map of rivers of Tabasco in case accompanying this volume.

(see Appendix I, Gazetteer of Towns). The river is navigable for vessels of 8 ft. draught as far as San Juan Bautista, 83 miles from the mouth. There are few shallows. Light craft can ascend another 100 miles to Sayula, at the foot of the Chiapas Highlands, above which the river is full of rapids. The upper part of the Grijalva is often called the Mexcalapan. The *Rio Gonzalez* is the chief outlet of the Rio Grijalva on the west. It empties into a lagoon, and is navigable for light craft throughout its length of 90 miles all the year round. On the east the Rio Grijalva receives many tributaries. The lowest, the *Rio Usumacinta*, enters about 16 miles from the mouth. It is longer, wider, and deeper than the Grijalva itself, and is navigable for steamers to Tenosique, about 167 miles from its mouth. This is the most important river in Tabasco. In its upper reaches, in part often called *Rio Chixoy*, it forms the frontier with Guatemala (see p. 11). Several of its tributaries are navigable, but the only one of importance is the *Rio Chilapa*, which, with its tributary the *Rio Tuliya* or Tepititan, is navigable to Salto del Agua in Chiapas, about 95 miles from Frontera. Two outlets or distributaries of the Rio Usumacinta on the east deserve mention: the *Rio San Pedro*, and the *Rio Palizada*. The latter, which is about 50 miles long, flows into the Laguna de Terminos. Above a shallow bar the river is deep and is used by steamers. Several other small streams flow into the Laguna de Terminos, and can be used by light-draught vessels. They include the *Rio Chumpan*; the *Rio Candelaria*, which has depths varying from 8–60 ft. for 15 miles; and the *Rio Mamantel*, which is navigable for 24 miles to El Pital, where, however, it is only 25 ft. wide. The upper reaches of these rivers are studded with rapids, but they can be used by canoes.

Yucatan, owing to its highly porous soil, has practically no surface streams except the *Rio Hondo* on the frontier of British Honduras. This stream, which is formed by the union of the Blue Creek or Rio Azul from the west and the Rio Bravo from the south, is 60 miles long and is navigable throughout for shallow-draught vessels. Blue Creek and the

Rio Bravo, on account of rapids, are fit only for canoes. A navigable creek connects the shallow Lake Bacalar, throughout the length of which there is a channel, with the Rio Hondo. The Rio Hondo is much used by river boats and has several settlements on its banks, including Payo Obispo at its mouth on the Mexican side and Consejo opposite in British Honduras. Its bar, which prevents large vessels entering, is rocky, has 5 ft. of water, and is 100 yds. wide. The Hondo is approached across Chetumal Bay by a narrow marked channel, 8-12 ft. deep. A common feature of the hydrography of Yucatan consists of *cenotes* or sink-holes, openings to subterranean streams through the limestone of the peninsula.

The rivers of the Pacific coast, though more numerous, are of less importance. Few of them are navigable even for short stretches and their valleys seldom form practical routes. The mouths are obstructed by bars. The *Rio Suchiate*, the lower course of which forms the Guatemalan frontier, and the *Rio Tehuantepec* are both unnavigable. The *Rio Verde* is a large river rising near Oaxaca in the Sierra del Sur. It has a great deal of water and carries much silt which causes shoal water far out to sea. The mouth has a dangerous shallow bar extending nearly a mile from the coast. There is no entrance from the sea and the river is not navigable.

The *Rio Dulce* is shorter than the Rio Verde. The bar shifts a good deal every rainy season but generally has 6 ft. at low water and a tidal rise of 7 ft. Except during onshore winds, when it is dangerous, shallow-draught vessels can cross it and reach the village of Tecopanapa at the mouth on the right bank.

The *Rio de Balsas* (Rio Mexcala), 430 miles long, is one of the largest streams on the Pacific side. It rises in the heart of the plateau near the Valley of Mexico. The upper course, known as the Atoyac, is used for water-power near Puebla. Several of its upper tributaries run underground for parts of their courses. Below the frontier of Guerrero the Rio Mexcala has many rapids and falls in its course through the Sierra Madre. Only in its lower course is the valley wide

and open and the stream navigable. The width of the whole river varies from 100 ft. to 700 ft. and its minimum depth is $1\frac{1}{2}$ ft. Many suggestions have been made for rendering this river navigable, but the cost is prohibitive. The delta is often known as the *Rio Sacatula*. The *Rio Grande de Santiago* is about 500 miles long. It rises in the volcanic region of the high plateau not far from Mexico City and flows through Lake Chapala on its long course to the sea. As far as Lake Chapala it is known as the Rio Lerma. Numerous falls interfere with navigation. The best known is the Juanacatlan Fall near Guadalajara which supplies power for that city's electric light. The fall is 70 ft. high and 524 ft. wide. In the dry season it dwindles to a number of small falls. Below the city of Guadalajara the Rio Grande flows for some distance in a cañon the vertical walls of which in places reach 4,000 ft. At the mouth of the river there is a dangerous bar extending 4 miles out to sea. The *Rio Fuerte* rises on the Pacific slope of the Sierra Madre Occidental and flows into the Gulf of California. It varies much in size with the season but flows all the year round. At San Blas in the wet season it is often as much as 25 ft. deep and has a speed of 7 to 10 miles an hour. In the dry season it is only 2 ft. deep and has a speed of a little over a mile an hour. Sand bars obstruct the mouth but shallow channels round them can be followed into the river. It is navigated by small coasters and rafts of dyewoods. The *Rio Yaqui* is a longer river, 390 miles, with a comparable course. Neither of these rivers has more than short navigable courses for small vessels, but both may eventually prove of some value for irrigation purposes. The *Rio Colorado* rises in the Rocky Mountains in the states of Wyoming and Colorado. Including the Green River, one of its head streams, the Colorado has a course of about 1,700 miles before it reaches the Gulf of California. The basin of the river embraces about a quarter of a million square miles. Only about 90 miles of the course is entirely within Mexican territory and another 20 miles form part of the international frontier. The whole of the Mexican course

is in the deltaic region of the river, a part of the Colorado desert. The channel is very sinuous and frequently shifts; there are several streams. About a mile north of the international frontier is the opening of the Imperial Canal built in 1900 to supply water via the Alamo River to the cultivated Imperial Valley (see p. 22). The intake canal silted up in a few years and was replaced by a cut direct into the Alamo River farther south in Mexican territory. In 1905 the winter flood of the Colorado broke the gates of this cut and the whole volume of the river flowed into the Salton valley working great havoc. The flow was not effectively stopped till 1907 and by that time the original bed of the Colorado River south of lat. $32^{\circ} 30' N.$ had become so choked with vegetation and silt that the waters found new outlets towards the southwest by the Bee River (Rio Paredones), Volcano Lake, and Hardy River past the foot of the Cocopa Mountains. At low water all the flow, and at high water most of the flow, takes this route to the Gulf of California which must now be regarded as the main stream of the Colorado. The intake of the Imperial Canal is now again in use. A huge dam has been built at the north end of Volcano Lake to prevent the waters passing north by New River to the Salton Sea, an eventuality that might otherwise occur since the flood level of Volcano Lake, which is 35 ft. above sea level, is higher than much of the ground to the north. The river level is highest in June when the waters are heavily charged with silt. About once in 15 or 20 years there are also floods in February and March. The Colorado is of little use for navigation. Philip's Point, on the east bank about two miles above Ship Yard Slough, is the head of navigation from the sea. The main channel carries 2 fathoms at low water up to that point. The channel on the west side of Montague Island is unnavigable. Above Philip's Point the channel of the Colorado is narrow, tortuous, and much obstructed by banks, on some of which there is not more than 2 ft. of water. Hardy River is about 500 ft. wide and has a maximum depth of 20 ft. The gradient, which varies with the height of Volcano Lake, is about 1 to 2 ft.

in 4 miles. The Bee River is broader but no deeper and has an awkward delta into Volcano Lake. Its length is 31 miles and its gradient about 2 to 3 ft. a mile. From the exit of Bee River the middle of the Colorado forms the international frontier for 20 miles to Pilot Knob where the first solid ground is reached. This reach is wide but shallow and has a gradient of $1\frac{1}{2}$ ft. a mile. Above Pilot Knob the Colorado is entirely in United States territory. Eight miles above Pilot Knob the Southern Pacific Railway of California crosses the river at Yuma, near the mouth of the Gila River, the lowest settlement on the Colorado. Laguna Dam, across the river, is 30 miles above Fort Yuma. The gradient from Pilot Knob to Laguna Dam is about $1\frac{1}{2}$ ft. a mile. There has been practically no commerce on the Colorado below Yuma since the Southern Pacific Railway was opened in 1877. Above Yuma traffic is confined to vessels drawing under 2 ft. when loaded. With a break at Laguna Dam the river is navigable for such craft for about 220 miles to the Needles where the Atlantic and Pacific Railway crosses. Navigation is in the hands of the Colorado Steam Navigation Co., which is owned in the United States and has three small river steamers and three barges on the service. American railway engineers report that to improve the navigation of the Colorado would incur a greater expense than is justifiable.

The rivers of Lower California are nearly all short mountain streams which flow only after rare rainfall. In the extreme south they flow all the year round. The only one of importance is the *Rio San Jose*, which has a fertile populated valley.

LAKES

Apart from the coastal lagoons there are few large lakes in Mexico. The important ones all lie on the high plateau. The largest is *Lake Chapala* in the volcanic region of the south, on the course of the Rio Lerma. It has an area of about 650 sq. miles and seems to be comparatively shallow, having a depth of $6\frac{1}{2}$ fathoms in July and August, and barely 1 fathom in April and May. Several rocky islets lie in the

lake. The only one of importance is Mescala, about $\frac{1}{2}$ sq. mile in area, and 100 ft. in height. This island has figured in Mexican history. At present it contains a residence of the provincial governor and small barracks. The lake abounds in fish. Most of its shores are well populated. A canal to Guadalajara has been planned.

In the northern part of the plateau there is a group of shallow lakes to the east of Torreon, of which *Lago de Parras* is the most important. They receive drainage from the Sierra Madre Occidental and have no outlet to the sea.

Lake Cuitzeo is a long lake about 40 miles in length, lying 80 miles east of Chapala. Its waters are said to be saline and charged with sulphurous gas. *Patzcuaro* is another large lake not far distant.

The lakes of the Valley of Mexico are the best known. They are *Lakes Texcoco* in the middle, *Zumpango*, *Xaltocan*, and *San Cristobal* in the north, and *Xochimilco* and *Chalco* in the south. In the time of the Aztecs Mexico City stood among these lakes, which were of greater extent than now, and was reached by metalled causeways. The city itself was partly built on floating structures to allow for the changes in level of the lakes. The city, however, suffered much damage during floods and gales. Drainage works were begun as long ago as 1450, but as the town grew, after the Spanish conquest, the difficulty of drainage increased. Floods were a continual menace to the city and played havoc from time to time despite many attempts to combat them. The problem was partially solved in 1789 by the construction of a deep cutting called the Tajo de Nochistongo $8\frac{1}{4}$ miles long from Lake Zumpango to the Rio Tula whence the surplus water reaches the Atlantic via the Rio Panuco.

In modern times the problem was further complicated by the necessity of finding an adequate outlet for the sewage of the City of Mexico, since the draining of the lakes caused Lake Texcoco, the largest one, almost to disappear in the dry season, leaving a sea of evil-smelling mud. In 1885 a new and probably final drainage scheme was inaugurated and was

completed in 1898. The work was carried on successively by Messrs. Campbell & Read, the Bucyrus Company of U.S.A., and Messrs. S. Pearson & Co. The works consist of a canal, 43 miles long, from Mexico City passing west of Lake Texcoco and across Lakes San Cristobal, Xaltocan, and Zumpango to a tunnel $6\frac{1}{5}$ miles long, cut through the northern rim of the valley east of the Tajo de Nochistongo, leading to the Rio Tula. The canal begins with a depth of 18 ft., increasing northward to 67-ft. 3 in., and can carry 618 cub. ft. a second, the maximum capacity of the tunnel. The tunnel, which is lined with brick, is 14 ft. in height and its maximum width is 13 ft. 9 in. The gradient is $27\frac{1}{2}$ ft. in $6\frac{1}{5}$ miles. There are 25 ventilating shafts.

In Yucatan the only lake of importance is the shallow *Lake Bacalar*, connected by a navigable creek with the River Hondo.

VEGETATION

Forests of tropical species, including many valuable hardwoods and dyewoods, cover most of the eastern and western coastal plains, except in Sonora where more or less desert conditions prevail. In parts, however, these forests have given place to plantations of tropical crops, particularly in Chiapas and on parts of the west coast. The Chiapas Highlands, the Tehuantepec isthmus, and Yucatan, except the north, are still forested. Few parts of the coasts, except sheltered coves, are fringed with mangrove swamps. The narrow sand and pebble bars that skirt the prevailing lagoons are generally barren.

The slopes of the sierras are also clothed in forests, oaks, planes, myrtles, and pines replacing the tropical species as the elevation increases. But here more than on the coastal plains the forests have been cleared, partly for agriculture and partly for fuel. An estimate puts the total area of first-class timber, tropical and temperate, in Mexico at 25,000,000 acres.

The high plateau has many trees in the southern wetter

part but no forests. The vegetation is essentially steppe-like, in which drought-loving plants like agaves and cacti flourish. These characteristics are most marked in the north. The plateau, however, has a fertile soil and with irrigation amply repays farming. Much of it is under cereal crops though cattle-rearing is the most lucrative agricultural occupation.

Lower California, except the Cape region, is virtually a desert, though in places, especially in favourable years, there is enough grass for a little stock-raising.

Among the plants of economic value either native to Mexico or introduced at a very early period, are sugar-cane, tobacco, various rubber-yielding trees, the agave (used to make *pulque* and also for fibres such as henequen or sisal hemp), vanilla, ginger, chicle or chewing gum (from a tree known as *zapote chico*, whose timber is valuable for piers and harbour works), the castor oil plant, cassava, hardwoods such as mahogany and rosewood, dyewoods such as log wood and dyer's moss (*Orchilla*), and the bamboo. The crops include cotton, cacao, coffee, rice, maize, beans, sweet-potatoes, yams, wheat, and in small quantities barley and oats. Oranges, lemons, limes, pineapples, bananas, guavas, and other tropical and subtropical fruits do well. It has been estimated that 114 species of timber trees and cabinet woods, 17 of oil-bearing plants, and over 60 of medicinal plants are indigenous to Mexico, and by far the larger part are represented in the *tierra caliente*. Further reference to plants of economic value will be found in Chap. V.

CLIMATE

Climatic Zones

The division of Mexico into three climatic zones, dependent on altitude, expresses generally the variation in climate found in the country.

The *tierra caliente*, or hot land, extends from sea-level to an altitude of about 3,000 ft. This includes, besides the sea-ports, a number of towns in the eastern part of the plateau.

The winter climate is warm and dry, with gentle trade winds, the uniformity of which, however, is much interfered with by 'northerners'. Summer is hot and humid. This is a region of tropical crops such as sugar, cotton, cacao, &c. It is on the whole unhealthy to Europeans.

The *tierra templada*, or temperate land, lies between 3,000 ft. and 6,500 ft. This is the finest climate in Mexico. Many important towns including Guadalajara, Orizaba, Oaxaca, Cuernavaca, and Cuautla lie in this zone. It escapes the extreme humidity of the lower zone and in winter has a dry climate free from the cold winds of the higher zone. Several places noted as health resorts and sanatoria are situated in the *tierra templada* (see p. 214). Semi-tropical products grow side by side with those of the tropics and wheat thrives well.

The *tierra fria*, or cold country, is cold only in comparison with the lower zones. It rises from about 6,500 ft. to the snow line and includes many of the chief cities of Mexico, such as Mexico City, Puebla, Pachuca, and Zacatecas. Winter is warm and sunny with cool nights. The temperature only occasionally falls below freezing point. Rainfall is less than elsewhere in the country and is deficient in the north. In sunny and sheltered valleys vegetation is often quite luxuriant. The altitude of this zone affects culinary operations owing to the low atmospheric pressure. Food values are said to decrease by one-third.

Seasons

Although about half of Mexico lies within the tropics only a relatively small part of the country experiences a true tropical climate. This is due to the great elevation of most of the country. The seasons are characterized by rainfall and drought rather than by high and low temperatures. Two distinct seasons occur in most parts of Mexico, the dry, *estio* or *estacion de las secas* (October to May) and the rainy, *estacion de las lluvias* (June to September). The rainy season on the coastal plains is unhealthy and trying to Europeans, but on the plateau it is the healthiest and most delightful time

of the year. The heat is tempered almost daily by a shower. At that season the dust is laid, flowers are in bloom, and the crops grow rapidly, the end of the rainy season being the time of harvest. During the dry season drought is a serious difficulty in many parts of the country, but only on the high plateau do the temperatures fall low enough to cause discomfort, and low temperatures do not last for long periods. Clear skies and bright sunshine generally prevail.

The longest day of the year in Mexico City has 13 hours' daylight, and the shortest day 11 hours.

Temperature

The highest temperatures are from May or June to August. The warmest month is generally July on the coastal plains and in the north of the high plateau, and May in the south of the plateau. On the coastal plains, both east and west, the mean of the warmest month varies from 80° to 84° F. At that season there is little difference between the temperature of the north and south of the plains including Yucatan. In the towns on the high plateau the mean temperature of the warmest month ranges from 64° to 73° F. In the more or less desert north, along the frontier of Arizona, it rises as high as 80° (El Paso) and in the Colorado desert to 91° F. (Yuma, U.S.A.). Temperatures of over 100° F. for a few days are not uncommon in the coastal plains.

The coolest months are December and January. The temperature in these months on the coastal plains and lower slopes falls to about 63° F. in the north and to about 71° F. in the south. Figures from the Gulf of California and Lower California are lacking but probably the mean of the coolest month is about 70° F. in these regions. On the high plateau the December or January mean ranges from about 42° F. north to 57° F. No month has a mean of 32° or below in any part of Mexico except uninhabitable mountain-tops. On the coastal plains the temperature never falls to freezing point. Frosts in Lower California occur only from December to April and at heights above 5,000 ft. The annual range in

temperature is greatest in the north of the plateau and least on the southern part of the coastal plains.

Actual mean monthly temperatures of the coolest and warmest months at certain stations in Mexico. Periods 2 to 29 years.

	°F.	°F.	
Matamoros	64.6 Jan.	84.2 July	} Atlantic Coast
Tampico	68.0 "	82.0 "	
Tuxpan	68.0 "	82.6 "	
Vera Cruz	70.9 Dec.	82.3 "	
Merida	72.5 Jan.	83.3 May	} Pacific Coast
Mazatlan	67.0 "	82.0 July	
Colima	69.5 "	81.0 June	
Salina Cruz.	75.0 "	81.0 August	
Monterey	56.0 Dec.	85.0 July	} High Plateau
Saltillo	52.3 "	73.2 "	
Leon	56.5 "	74.0 May	
Mexico	53.4 "	65.0 "	
Puebla	54.6 Jan.	65.0 "	
Jalapa	58.0 "	68.7 "	
Oaxaca	63.0 "	73.5 "	
El Paso	44.0 "	80.4 July	
Yuma (U.S.A.)	54.6 "	90.5 "	

Rainfall

The rainy season in most parts of Mexico is from about May or June to September or October, but rain may come in winter with the northers (see p. 40). On the southern part of the Pacific coast it generally begins in April.

Lower California, except the southern end, has winter rains which are light and in some years do not occur. The southern end or Cape region has summer rains like the rest of Mexico.

The driest period in Mexico is as a rule from December to March or April, but even during this period a certain amount of rain falls, especially in the southern end of the Sierra Madre Oriental and in Tabasco, or if rain does not fall there is frequently a thick wet mist. In Tabasco March or April to June is the finest season.

Lower California, except the Cape region, is practically rainless in summer. In the heart of the high plateau of Mexico the winter especially is dry.

Snow occasionally falls on the high plateau between

December and March but seldom lies long on the ground. Perennial snow caps the summits above 13,000 ft.

The total annual rainfall varies much in different parts of the country. It is highest in the Chiapas Highlands (nearly 200 in.) which receive tropical rains, on the southern and western shores of the Gulf of Campeche (60–80 in.), and on the southern Atlantic slopes of the high plateau (50–100 in.). Rainfall is less heavy on the Pacific slopes of the plateau (30–50 in.). The annual fall is small in Yucatan (20–30 in.), the northern heart of the high plateau (10–25 in.), the Sonora region and Lower California, excepting the Cape region (less than 10 in.).

Rainfall statistics for long periods of years are available from few localities in Mexico, and most of them are from places in the southern part of the high plateau. Data from the Pacific coast and the northern part of the high plateau are most inadequate. From Lower California few or no figures are available.

A theory which has much vogue amongst Mexican writers is that the rainfall throughout the country shows a steady decrease from year to year. The annual rainfall certainly varies a good deal in some stations but the available figures are too inadequate to prove or disprove the theory.

*Total annual rainfall at certain places in Mexico.
(Mean of 2 to 41 years' observations)*

	in.			in.	
Matamores .	37	} Atlantic coast.	Yuma (U.S.A.) .	3	} High plateau and slopes.
Tampico .	33 (1 year)		El Paso .	9	
Tuxpan .	57		Chihuahua .	25	
Vera Cruz .	69		Monterey .	20	
San Juan Bau-	100 (1 year)		Saltillo .	22	
tista		} Pacific coast.	Zacatecas .	27	
Merida .	33		Guanajuato .	28	
Guaymas .	28		Guadalajara .	34	
Mazatlan .	32		Leon .	26	
Tepic .	56		Mexico .	24	
Manzanilla .	24 (?)		Puebla .	45	
Colima .	40		Tacubaya .	26	
Acapulco .	43		Jalapa .	58	
Salina Cruz .	32 (1 year)		Oaxaca .	33	
Tapachula .	99		Ixtacomitan (Chia-	187 (1 year)	
			pas)		

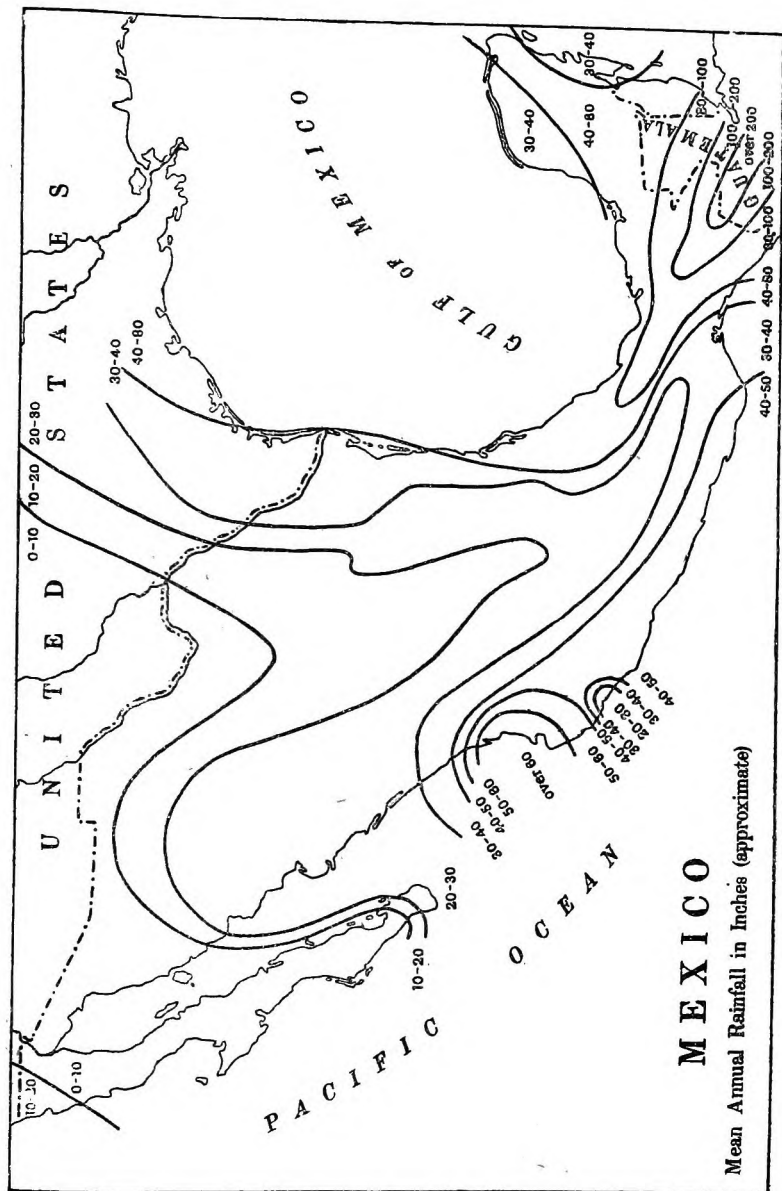


FIG. 1.—MEAN ANNUAL RAINFALL.

Owing to annual variations in the amount of rainfall and probable inaccuracy of the returns furnished by certain observatories these figures must be accepted as only approximately correct.

Winds

On the Atlantic coast the trade winds prevail. They blow generally from the north and north-east in Yucatan but on other parts of the coast their general direction is from the south-east and east. This applies to Vera Cruz and Tampico and is especially the case from April till June or July. In the night there is generally a land breeze from south to south-west. The trade winds are normally light but they are accompanied by violent squalls from June to October. From May to July calms are frequent. From October to February or March the 'northers' blow. These are the strongest winds on the coast and practically the only ones that interfere with shipping. They are of the nature of monsoon winds and are associated with the relatively high temperature of the surface waters of the Gulf of Mexico. Northers are of two kinds. The strong northers (*norte fuerte*) known as *huesco colorado* (red core) arise suddenly and blow with great violence for about 48 hours, and are succeeded by delightful weather. Less violent northers (*norte chocolatero*) sometimes last a fortnight and are accompanied by gloomy weather and rain. The temperature falls 18° to 27° F. when northers set in. The strength of the wind generally moderates during the night.

On the Pacific coast north-westerly winds blow fairly steadily during winter, and north of about lat. 24° N. in summer. Land breezes blow during the night. From April to September or October south-east to south-west winds, often strong and accompanied by rain, blow on the coast south of the Gulf of California. This is the bad weather season. Between May and November, and commonly in October, heavy cyclonic gales, called *cordonzos* or *chubascos*, occur, and may do great damage, as for instance in 1881 at Mazatlan and Manzanilla. These gales set in at north-east

and shift to south-east and south-west from which quarter they blow with great violence.

The Gulf of California normally experiences north-westerly winds. These are also the chief winds on the west coast of Lower California but violent gales from the south-east sometimes blow. Northers, known as *tehuantepecers*, blow in the Gulf of Tehuantepec from December to April. Unlike the northers of the Atlantic coast they blow in a clear cloudless sky and bring no rain. Their effect is seldom felt more than 10 to 15 miles from the land. On the high plateau winds as a rule are light. In the south and east of the plateau they are generally north-west to north-east. Northers are experienced in the southern part of the plateau but they never blow with great strength.

EARTHQUAKES

Earthquake shocks are of frequent occurrence, but within recent years have seldom been violent. The centre of earthquakes in Mexico is in the south-east of the country in the states of Oaxaca and Guerrero, that is to say, adjoining the volcanic region in the southern part of the plateau. Shocks occur less frequently in other parts of the Pacific coast. Few have been recorded from Lower California. The northern part of the plateau and the Atlantic coast are almost immune. No earthquakes have been reported from Yucatan, and few from the Chiapas Highlands. On the other hand, Central America often experiences violent and destructive earthquakes.

LOCAL TIME

Standard time of the meridian of Tacubaya Observatory has been adopted throughout Mexico. It is 6 hrs. 36 min. 46.67 secs. slow on Greenwich mean time.

MAGNETIC VARIATION

The magnetic variation for 1918, calculated from the latest Admiralty Charts, is as follows :

Atlantic Coast : Progreso, $6^{\circ} 0' E.$; Puerto Mexico, $7^{\circ} 16' E.$; Vera Cruz, $7^{\circ} 48' E.$; Tuxpan, $7^{\circ} 48' E.$; Tampico, $8^{\circ} 13' E.$ The annual increase is about 2'.

Pacific Coast : Salina Cruz, $7^{\circ} 13' E.$; Acapulco, $8^{\circ} 27' E.$; Manzanilla, $9^{\circ} 15' E.$; Mazatlan, $10^{\circ} 4' E.$; Topolobampo, $10^{\circ} 25' E.$; Guaymas, $12^{\circ} 20' E.$; La Paz, $11^{\circ} 28' E.$; Magdalena Bay, $12^{\circ} 13' E.$; Ensenada, $15^{\circ} 0' E.$ The annual increase is about 2' at Salina Cruz, 3' at Manzanilla, 4' at Mazatlan, and 5' at Ensenada.

ANIMAL LIFE

There is great variety of animal life. The puma, jaguar, ocelot, and wild cat are beasts of prey found in the forests. Bears and wild boars are also found in parts. On the high plateau and the mountains of the north there are wolves and coyotes. In the southern forests are numerous kinds of monkeys, one species of sloth, and many vampire bats. Smaller wild mammals include the hare, rabbit, squirrel, several kinds of deer, beavers, opossums, moles, skunks, martens, and otters. Domestic animals, introduced by the early Spanish settlers, are horses, asses, cattle, sheep, and goats. They have all thriven well, especially horses, which are said to retain the form and spirit of the Andalusian and Arabian stock from which they sprang. The chief cattle ranches are in the north of the plateau. Despite the large number of cattle in the country, Mexico is not self-supporting in meat, and imports normally large quantities from the U.S.A. The production of milk and butter is relatively small (see p. 123).

Birds of prey are the eagle, hawk, and turkey-buzzard, the last of which is useful as the scavenger of the coast towns. Brilliantly coloured parrots, humming-birds, trogons, and mocking-birds are numerous in the forests. The turkey and the *huahuloth*, a species of duck, are the only native birds which have been domesticated. Introduced domestic fowls are found in all villages.

There are several species of poisonous snakes, such as the rattle and coral snakes. They occur both on the plateau and on the lowlands. Boas are found only in the southern forests. Lizards are found everywhere, but particularly in the hotter and more arid regions. The iguana is used as food by the natives. Alligators are found in many of the river mouths. Turtles are taken in considerable numbers on parts of the coasts, especially Yucatan and the eastern part of the Pacific coast. Fish are abundant in the seas, streams, and lakes. Sharks are a nuisance in many of the harbours.

In the Gulf of California there are valuable beds of pearl oysters. Insects are a pest. Scorpions are numerous, and their bites are dangerous. Mosquitos infest the low plains and spread malaria and yellow fever. Owing to the abundance of lagoons and swamps, which form ideal breeding-grounds, it is difficult, if not impossible, to exterminate them except in the vicinity of towns. The sand-flea or 'jigger' is another dangerous insect which is common on sandy shores and around lagoons.

GEOLOGICAL FORMATION

Archean and Primary rocks are rare in Mexico unless the crystalline rocks of the Sierra del Sur prove to be of the former age. Some Carboniferous limestones and dolomites occur near the frontiers of Guatemala. Cretaceous rocks are widespread, and form the great part of the Sierra Madre Oriental and most of the high plateau. Tertiary rocks also play an important part in Mexico. Sedimentary beds of this age occur in the eastern coast plains and cover the whole of Yucatan. They are found also on the high plateau, but the most widespread Tertiary rocks are of volcanic origin. Lavas, agglomerates, and ashes cover much of the western part of the country, and in the south of the high plateau extend eastward almost to the coast. They form almost the whole of the Sierra Madre Occidental. Eruptions of volcanic rocks have continued until the present day, but in much diminished intensity compared with the Tertiary period. Quaternary rocks are conspicuous

in certain parts. They form most of the Pacific coastal plains from Sonora to Chiapas, and appear as a narrow strip along the Atlantic seaboard. There is a good deal of Quaternary deposits on the high plateau. Granites and other crystalline rocks form the greater part of Lower California except the south, but the Cape region itself is crystalline.

CHAPTER III

ETHNOGRAPHY AND SYSTEM OF GOVERNMENT

Population (Numbers and distribution—Mexican white population—Mestizos—Indians—Foreign population)—Religion—Education—System of government—Legal system.

POPULATION

THE people of Mexico may be divided into three classes : (1) the people of pure European, largely Spanish, descent ; (2) the half-castes or mixed population (*mestizos*) ; (3) the Indians, the descendants of the indigenous population of the country, who inhabited it before the Spanish conquest. In addition to these three chief classes there are the Oriental foreigners—Chinese, Japanese, Arabs, &c.—and the negroes, who form only a very small part of the population.

Numbers and Distribution of the Population

The census of 1910 gave the total number of the population, in round figures, as 15,160,000 (different accounts of this census vary slightly). The figures for the individual states and territories are as follows :

<i>State or Territory.</i>	<i>Pop.</i>	<i>State or Territory.</i>	<i>Pop.</i>
Aguascalientes . . .	120,511	Nayarit (Tepic) . . .	171,173
Campeche	86,661	Nuevo Leon	365,150
Chiapas	438,843	Oaxaca	1,040,398
Chihuahua	405,707	Puebla	1,101,600
Coahuila	362,092	Queretaro	244,663
Colima	77,704	Quintana Roo	9,109
Durango	483,175	San Luis Potosi	627,800
Federal District . . .	720,753	Sinaloa	323,642
Guanajuato	1,081,651	Sonora	265,383
Guerrero	594,278	Tabasco	187,574
Hidalgo	646,551	Tamaulipas	249,641
Jalisco	1,208,855	Tlaxcala	184,171
Lower California . . .	52,272	Vera Cruz	1,132,859
Mexico	989,510	Yucatan	339,613
Michoacan	991,880	Zacatecas	477,556
Morelos	179,594		

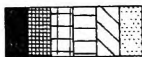
The estimated population in 1912 was 15,502,000, and the census of 1900 gave a total of 13,611,000. This last was certainly an understatement, and the figures for 1910 are probably considerably in error, as it is extremely difficult to take an accurate census in Mexico. The figures for Indians are particularly untrustworthy, as some Indian tribes are isolated and primitive, and even the Indians of the towns are suspicious of, and endeavour to avoid, the registration.

The centre of most dense population is around the city of Mexico, the Federal District having an average of 1,556 persons per square mile in 1910. From the annexed map it will be seen that the next most thickly peopled states, Mexico, with 107 people to the square mile, Tlaxcala, with 115, Guanajuato, with 95, Puebla, with 90, and Hidalgo with 74 are all grouped round the Federal District. The larger part of the population of Mexico thus lives on the southern slopes of the central plateau. These states are surrounded in their turn by a ring of states (Jalisco, Michoacan, Oaxaca, Vera Cruz, Guerrero and San Luis Potosi), having between 20 and 45 people to the square mile. The rest of the country, the tropical plains to the south, and the arid land in the north, is very thinly peopled, Lower California and Quintana Roo, with less than one person to the square mile, being the lowest in the scale, followed by Sonora with 3, Chihuahua and Campeche with 4, Coahuila with 5, and Yucatan and Sinaloa with 9 people to the square mile. It should be observed that the map only indicates average density by states, and does not take account of local concentration of the population in towns, mining localities, &c.

The population, down to 1910, had increased rapidly in Guerrero, Sonora, Nayarit, and Coahuila, owing to mining activities, and in the case of the state last named, to the extension of cotton cultivation in what was previously desert country. All the states, with the exception of Colima, where the unhealthy coastal climate is a drawback and where the population has remained practically stationary since the census of 1868, show an increase of population between 1900

AVERAGE DENSITY OF POPULATION IN THE STATES & TERRITORIES OF MEXICO Census of 1910

Inhabitants
per Square Mile



Over 115
50-115
25-50
20-25
1-20
Under 1

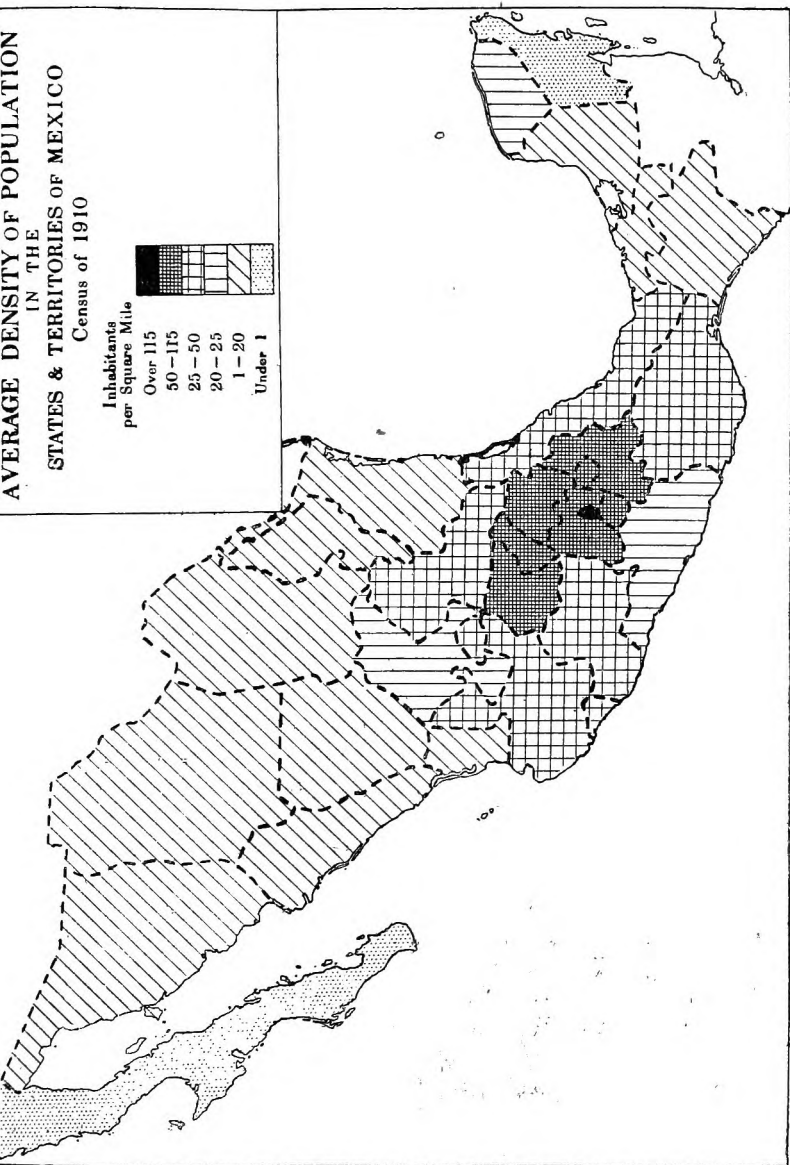


Fig. 2.—AVERAGE DENSITY OF POPULATION.

and 1910. In proportion to its area Mexico is more densely peopled than any other of the Latin-American republics. In 1910 the population consisted of 7,504,000 men and 7,656,000 women.

Mexican White Population

The white people born in Mexico, sometimes termed Creoles, are estimated at 19 per cent. of the total population, but this is probably an overestimate; the lines between them and the *mestizos*, and between *mestizos* and Indians, cannot be accurately drawn. They form the aristocracy of Mexico, and their Spanish dignity and traditions have rendered them to some degree a steadying force in the country. They are largely Spanish in type and slender in build, with dark hair and eyes; in the tropical country they have little colour, but in the colder parts rosy cheeks and even fair hair are met with among them. A type of face with aquiline nose and thin lips is common. They are lively and intelligent, active but not very muscular, generally they are expert riders and dancers. In character they are passionate, and often vain and ambitious, but they always preserve their dignity and their politeness. As a class they are thoroughly nationalized Mexicans, even more so than the mixed population; they are tolerant and progressive, but improvident. They include land-owners, officials, doctors, lawyers, and traders, and often own mines and factories, but as business men they commonly lack initiative, and commerce has been very largely in foreign hands.

Mexican society of the upper class is far more exclusive and old-fashioned than Spanish society in Madrid; the women, who are often very attractive when young, though their beauty is soon lost, are kept in almost Mohammedan seclusion; this system is only slowly breaking down under the influence of foreign example and education. Mexican family ties are close, and the children show much love and respect for their parents; the women make good mothers, but bad housewives, since any interest in household affairs

is considered beneath them. Immorality of both sexes is very common.

Mestizos

Numbers and Characteristics.—The mixed population of Mexico, the *mestizos*, who form about half the total population, and are said to be increasing at an annual rate of about 3 per cent., are a homogeneous race, in so far as they all speak the same language, Castilian Spanish, with only slight differences of pronunciation, and have the same customs and, in the great majority of cases, the same religion. They may thus be called the Mexican people, and described as having the same general characteristics as other Spanish-American peoples, where Spanish manners and customs are modified by native blood and traditions, and the influence of a tropical climate (so far as that applies in Mexico). The dissimilar races from whom the Mexicans have sprung, however, are not as yet sufficiently fused to give a representative type, every degree between European and Indian being represented among them, complicated by negro and other alien strains. Since the conquest there has been a constant intermixture of Spanish and Indian blood, and many Spaniards have married Indian women. The difficulties of communication with Europe have been an important factor in the rapid formation of this half-caste class, in which the Indians living in the centres of population, who speak Castilian and are more or less developed, are included. In consequence of the extremely mixed character of the people, there is hardly any colour prejudice in Mexico; the varied half-caste population is classified rather according to education and position than by colour, and though the Indian is still regarded as an inferior being, he is technically equal with the white or semi-white population.

The *mestizos* are seldom over middle stature, and have thick dark hair, brown or black eyes, and a light-brown skin. They have the small hands and feet and white teeth of the Indian, and the higher forehead and more aquiline nose of the Spaniard. In mentality and tastes they are largely

European ; they are often artistic and intelligent, but are still mostly poor and ignorant, and it will be long before they attain a European standard of public life. Dishonesty and corruption are rife in every class, and they have failed so far to rise to a conception of patriotism. The Mexicans, from the well-educated upper class, almost European in type, down to the poorest *peon*, are invariably courteous, hospitable, and kindly ; they are eloquent, with a natural tendency to exaggeration, prone to flattery and fond of outward display and ceremonial, so that marked politeness of manner is a necessity to the foreigner dealing with them. With such a character goes naturally a lax sense of truthfulness and honour, and a lack of regard for the property of others. In contrast to the Spanish and Indians, they are usually cowards. The people of the poorer classes are often densely ignorant, and very easily roused to anger and violence. Thieves and beggars abound everywhere. Illegitimate births are very numerous, partly because the poorer classes, who were taught that civil marriage is a sin, cannot afford the expense of marriage by a priest, but also because the general moral standard is very low. Marriage is now (under the Constitution of 1917) a civil contract. The Mexicans as a whole are quick but lacking in judgement and stability of character, and are prone to talk rather than to act.

Society.—Though Mexican society is nominally democratic and there is little class-feeling, as a result of Spanish influence it is sharply divided into classes, and the rich land-owning class stands in marked contrast to the impoverished *peons* and Indians. Another legacy of aristocratic Spanish society is found in the general dislike and scorn among Mexicans of manual labour, which keeps young men, who often make inefficient clerks, in the towns, and deprives the country of a race of intelligent peasants with white blood. The *mestizos* are usually found as small traders, plantation overseers, petty officials, miners, servants, artisans and to some extent as teachers and professional men in the provincial towns ; they also form the great army of mule-drivers.

Indians

Numbers.—It is not possible to give a definite total for the Mexican Indians, partly because they evade the census in many parts, and partly because it is impossible to draw a distinct line between the pure Indians and those of more or less mixed blood. Their names give no clue to their parentage, since these are almost invariably Spanish. They probably form some two-fifths of the total population. Though constitutionally strong they suffer much from small-pox and other epidemics, and child-mortality is very high among them owing to the carelessness of the parents, their unhygienic lives and their miserable houses. None of the tribes appears to have actually decreased during the past half-century, their numbers having remained nearly stationary, to which tribal intermarriage is a contributory cause.

Characteristics.—The history of the Mexican Indians is bound up with that of the North American aborigines, since representatives of every zone are gathered in Mexico; and owing to the variety of type it is difficult to characterize them in general terms. The great mass of Indians, however, are rather short, and have a reddish-brown skin, slightly prominent cheek bones, low forehead, a wide nose and thick but not negroid lips; their eyes are large and black, and their hair is black, straight, and coarse, often hanging to the shoulder; grey hair and baldness are rare. Their hands and feet are finely made, and though they are strong, they are very slender in build. They bear a strong general resemblance to the Japanese peasant. The natives of the high plateaux are healthy, well-built, and muscular. All Indians strike a European observer as sad-looking, but they are really a cheerful people; they make brave soldiers, capable of great endurance, and are splendid carriers and runners. The women are also strongly built, and often good-looking.

Present Conditions.—The Indians are slowly merging their life with that of the other inhabitants of the country, and the process has been accelerated by the diffusion of the knowledge

of Spanish and the improvement of communications. Although the authority of certain families is still recognized in purely Indian villages, their national life has now largely disappeared ; they have practically no literature, no class divisions, and no special culture, but live in a state of semi-servitude on the estates and in the villages, cultivating the soil, and working in the mines and as servants. The family and communal ties are very strong among them, and even when they work elsewhere, they are always anxious to return to their own village. They possess the political and civil rights of the born Mexican, but exercise as yet little influence in the government of the nation, and have no national organization or intellectual centres of their own, although a few Indians have occupied high positions, and a certain number of them have risen to the rank of artisans and mechanics. Some of the tribes in Chihuahua, Sonora, and Sinaloa, and in the less-developed parts in the south, are still quite primitive. The majority of the Indians no longer possess any land of their own and are hired labourers, who have hitherto frequently been in reality enslaved debtors, since they are improvident, and are in the power of their employer when they are in his debt. The Spanish did everything possible in the past to reduce the Indian from a land-owning and developed race to a state of serfdom, and the effects of the long period of slave-labour are still existent. These account for the survival of peonage, with its undoubted abuses and occasional cruelties, such as the transport of the mountain Indians, who are more industrious workers than those of the lowlands, to labour in the tropical plains of Yucatan, where they suffer severely from fever. These workers have often been men arrested for small offences, and handed over to labour contractors, who advanced sums of money to men contracting to labour for a very small wage, and thus had the workers entirely in their power. The Indian labourers' life is often degraded, their moral standard low, their persons unclean and their houses wretched and dirty. Drunkenness is very common, and is the curse of many Mexicans, the favourite drinks being

pulque and *mezcal*, distilled from a sort of cactus called *maguey*, *aguardiente* made from sugar-cane, and a drug called *mariguana*, which has maddening effects. The Constitution of 1917 imposes upon the Federal and State Governments the obligation of taking measures against alcoholism. Gambling, cock-fighting and bull-fighting are extremely popular.

The usual food consists of *tortillas*, flat maize cakes, and *frijoles*, haricot beans, with chillies, potatoes, and sometimes meat; coffee is much esteemed, and much tobacco is smoked. The tortilla is made of maize soaked in water for two or three days and ground between stones into a paste (*nixtamal*). This is made into cakes flattened between the hands, cooked, and eaten fresh; they will not keep for two days. The Indian houses are one-roomed huts of mud (*adobe*) or wood shingles on the high plateaux, and of bamboo in the plains, with an earthen floor, and a roof of shingles or rushes. Stones for grinding maize, a few earthen pots and pans, sleeping mats, baskets and gourds form the only household goods. The men wear two simple cotton garments, with a coloured blanket for warmth, and a large, wide-brimmed hat. The women's usual garments are a sleeveless blouse and skirt, with a shawl (*rebozo*); they wear no hat or shoes, but in some parts, in particular in Tehuantepec, they have an elaborate holiday costume, including enormous starched caps. Before the conquest they had brought many arts to a high state of perfection, and they still make good pottery, and the women embroider beautifully on linen.

For such a simple life as theirs the low wages which they receive suffice, and since the Indian is unfitted by his mentality and conditions of life for hard work, he is usually a lazy and unintelligent worker, and set against any new methods. The Indians are by no means always truthful or honest, but they are always polite and hospitable, and as a rule docile; though their progress is slow, and they are still very superstitious. Some are extraordinarily stupid, others, particularly the Mayas, are willing to receive education, and show considerable aptitude. Natives educated in Mexico City have

54 ETHNOGRAPHY AND SYSTEM OF GOVERNMENT

been sent out as teachers of Spanish and arithmetic, and since 1912 209 schools for natives, which have 13,616 pupils, have been founded. The Indians are all Roman Catholics, but their religion is mixed with superstition, and pagan and mediaeval customs still flourish. A large number of the priests are Indians.

Languages.—The Indians have been divided according to their language into twelve linguistic families, and this list is expanded by some authorities by the addition of other groups. They are here arranged roughly in order of numerical importance.

(1) *Nahuatlan or Mexican.*—These tribes occupy an almost unbroken stretch of country on the Pacific slope from Sinaloa to Guatemala and a broad belt across southern Mexico. They are a widespread people, who came from the northwest, and overran the original inhabitants, and they constitute over a quarter of the present Indian population. The Aztecs, the most prominent people in the history of the conquest, were a Nahuatlan tribe who established themselves on the high tableland of Mexico.

(2) *Otomian.*—The Otomi live in the centre of Mexico, in Guanajuato, Michoacán, San Luis Potosi, Hidalgo, Mexico State, Zacatecas, Queretaro, &c. They are a mountain race, hardy and less civilized than the other more important Indian peoples.

(3) *Zapotecan or Misteca-Zapotecan.*—The Zapotecas live chiefly on the southern slopes of the central plateau, in Oaxaca and Guerrero; they are an energetic race who were never subdued by the Aztecs, and are recovering from the effects of Spanish enslavement more rapidly than any other of the indigenous peoples. Their prehistoric civilization seems to have been the equal of that of the Mayas.

(4) *Mayan.*—The Mayas, who were the most advanced people of the old Mexican civilization, having large well-built towns, terrace-cultivation, and an efficient form of government, live in Yucatan, Chiapas, and Vera Cruz. The remarkable ruins in these states and in Honduras are ascribed to

them. They have suffered much from epidemics, but have reconstituted themselves, and have preserved their own language more completely than any other of the Indian peoples. They make good workmen.

(5) *Tarascan*.—The Tarascos live in the south-west, chiefly in Michoacan, and also in Guerrero and Jatisco.

(6) *Totonacan*.—The Totonacas live on the gulf coast, in Vera Cruz, and in Puebla.

(7) *Piman*.—The Pimas, who are probably a branch of the Nahuatla, live in the north-west, as far south as Guadalajara, but are cut off from the sea by the Nahuatla.

(8) *Zoquean*.—The Zoquean people live in the centre of the south of Mexico, in Oaxaca, Puebla, Guerrero, Chiapas, Tabasco, &c.

(9) *Athapascan*.—The Athapascans, who are Apache intruders from the United States, live in the north, in Chihuahua, Sonora, and Coahuila.

(10) *Huavan*.—The Huavan people live in Chiapas and Tehuantepec.

(11) *Yuman*.—The Yuman people form the remains of a great tribe inhabiting Lower California.

(12) *Serian*.—The Serian people, who are few in number and quite undeveloped, live in Sonora and on Tiburon Island off the coast.

Some authorities include Zoque or Mixe in Oaxaca, Chiapas and Tabasco, Tequistlatecan and Chinantecan in Oaxaca, Chiapanecan in Chiapas, Coahuiltecan in Coahuila, Chihuahua, Nuevo Leon, and Tamaulipas, and Tañeoan in Chihuahua.

Of these groups the first four are the most important, and the Nahuatlans, Otomis, and Zapotecas, together with the Tarascos and Totonacas, have advanced a considerable way in civilization. Several of the languages are highly developed, and have a certain amount of literature of their own; they are all still more or less widely in use and are mutually incomprehensible. Mayan is spoken in Yucatan, Chiapas, Tabasco, Quintano Roo (and also in Belize and parts of Guatemala), and Otomian and Nahuatlan in the centre of Mexico. In the

north, where the Indians were never under the Aztec empire, and were consequently less developed, they have lost their own language, and in general a large and increasing number of Indians speak Spanish, though it is still not understood in some outlying parts. In addition to the more important Indian languages, there are a large number of constantly varying dialects still in use, forming some 150 tongues altogether, but they are mostly spoken by small and unimportant bodies of people, have a very small vocabulary, and are disappearing. These languages are only used in the villages, Spanish being spoken in the towns and on the large estates, and none of them is written. The Indian languages as a whole do not coincide with any natural boundaries, but are mixed or found in scattered groups, indicating the interpenetration and shifting of population which has always gone on.

Foreign Population

There were 116,527 foreigners in Mexico in 1910, which shows a large increase on the 57,500 in the country in 1900, mostly due to the much larger numbers of Spanish, Americans, Guatemalans and Chinese who entered Mexico. The Spanish and Americans are found all over Mexico, in the country as well as in the towns, but owing to the small opportunities afforded to other foreigners of acquiring land, these are found mostly in the towns.

Spaniards.—In 1910 there were 29,541 pure-blooded Spaniards in the country, and they still form an important white class; they are energetic and full of persistence and ambition, particularly in the first generation, before the climate of the country has affected them. Their intimate connexion in blood, language, customs, and religion, with the Creole and mixed population, give them a certain advantage over other Europeans. They frequently marry *mestizos*. They own many banks, factories and plantations, and they have the grocery trade largely in their hands.

Americans and British.—The Americans, who numbered 28,639 in 1910, and later increased rapidly in numbers, have

very large economic interests in the country. They are found in every department of industry and trade ; in addition to their predominant interests in the mining and oil fields, a number of the large estates of central and northern Mexico and the plantations of the south are in their hands. Their business methods are said to be generally unpopular with Mexicans. The town population, indeed, has been Americanized to a considerable extent of late years, but the Spanish spirit and point of view persists among the masses of the people. Though few British or Americans marry Mexican wives, their children grow up in the country, and have had a considerable influence on the customs and ways of the Mexican population ; the climate, however, does not suit white children, or even those of impure white blood. The British in Mexico, who numbered 5,264 in 1910, are rich and enterprising, and have extensive interests especially in the oil-fields and mines, as well as in railways, plantations, &c., but their trade has been declining for some time, having gone very largely into German hands ; that of the Canadians, however, has increased. The British are generally liked and respected.

French.—The French, who numbered 4,604 in 1910, are popular and wealthy, and practise many different trades ; the drapery trade has been captured by French from the valley of Barcelonnett ; in the Basses Alpes ; there are several French agricultural settlements in Vera Cruz, Puebla, Morelos, Chiapas, and Chihuahua, while French mining interests are not inconsiderable.

Germans.—The Germans were said to number 3,827 in 1910, but later estimates give much higher figures ; one of 1916 stated that there are 16,000 Germans in Mexico, including 4,500 in Mexico City, and in the following year it was asserted that 25,000 had crossed the frontier from the United States, in addition to immigrants from Cuba and South American republics. Before the war they had developed their trade very rapidly ; they had practically monopolized the hardware trade, and had large interests in banking. They frequently

marry Mexican wives and settle in the country, and have merged themselves with the Mexican population to a much larger extent than have the British or Americans.

For many years the Germans, few as they were, have endeavoured to impress their economic and cultural methods upon Mexico. In Mexico city they have a German school and hospital, a Lutheran church, and several clubs, and there are similar institutions in other large towns ; moreover, it is said that they have taken over many schools which were formerly in clerical hands. At an early period in the European War (before the entry of the United States) evidence accumulated of powerful German influence in Mexico, and it was stated that the *de facto* Government was in sympathy with the Germans, that their interests were the only foreign interests to receive protection, &c. In January 1917 the Germans made plans, in the event of the entry of the United States into the war, to form an alliance with Mexico, which in consideration of active participation in the war should recover the 'lost territories' of New Mexico, Texas, and Arizona ; it was to be suggested that the Mexican Government should offer mediation between the United States and Japan, and secure the adherence of the latter. Later in the year a sharp division of Mexican opinion for and against Germany appears to have arisen, and a campaign for the severance of diplomatic relations with Germany was initiated, while the Government professed a rigid neutrality (cf. p. 97).

Italians.—The Italians, who numbered 2,595 in 1910, were late comers in Mexico, but have gained a good name as hard and thrifty workers. There is a flourishing Italian settlement, Fernandez Leal, largely occupied in cattle-raising and fruit-growing, near Cholula, Puebla.

Cubans.—The Cubans, who numbered 3,478 in 1910, came as refugees to Vera Cruz, where they are occupied in tobacco cultivation, and also to Yucatan ; they quickly merge into the Mexican population.

Guatemalans.—The Guatemalans numbered 21,334 in 1910, and in subsequent years left their country in increasing

numbers for the richer lands of Mexico ; many took refuge in Mexico after the Guatemalan earthquakes of 1917-18. Like the Cubans, however, they rapidly assimilate themselves with the native population of the country.

Chinese.—The Chinese increased in numbers from 2,834 in 1900 to 13,203 in 1910. They are hard-working, and are valuable in the mines of Sonora and Chihuahua, and as servants, but their advent has given rise to considerable apprehension, since they accept very low wages, and do not assimilate themselves to the people of the country, though they frequently marry Indian or half-caste women, when their children are brought up with the language and religion of their mother. The Chinese are frequently accused of importing the opium habit, and of obtaining certificates of naturalization in Mexico in order to enter the United States as Mexican citizens.

Japanese.—The Japanese numbered 2,276 in 1910. They are mostly agriculturists, and have established a successful colony in Chiapas. Korean labour has recently been imported into Yucatan.

Turks.—The so-called Turks are Maronite Christians from Syria, who have formed a colony in Yucatan, and numbered 2,907 in 1910. Here they form an influential trading class, united in a social-economic society of their own. The Arabs, who were returned as numbering 1,546 in 1910, were probably Mohammedans of various races.

Negroes.—The few negroes in the country are descendants of slaves imported in the past, and come from the United States, Jamaica, Cuba, Belize, &c. ; they are mostly artisans, living in the ports.

Mormons.—A number of Mormon colonies are in existence at Dublan, Juarez, Pachecho, Diaz, and Garcia, in northern Mexico, the earliest having been founded in 1882. The colonists, who are of Scandinavian, British, German and Swiss extraction, are prosperous and well-behaved ; they are good agriculturists and increase rapidly in numbers. They are a closely organized society, keen on proselytizing in

the cause of their religion, but not mixing with the rest of the population and having no relations with the country of their origin.

Boers.—There are also several Boer agricultural settlements in northern Mexico, which are less successful than those of the Mormons, since colour-prejudice is too strong among the Boers, accustomed as they are to Kaffir labour, for them to get on well with the Mexican natives.

RELIGION

Roman Catholicism is the religion of the vast majority of the Mexican people, and the Roman Catholic Church has played a part of enormous importance in the history of the country. It is now independent of the State, and there is tolerance of all other religions, but Mexico is still one of the strongholds of Roman Catholicism. Although religious observances and beliefs have fallen into discredit with many Mexican men as a natural reaction against clerical domination, and liberal and revolutionary opinion is almost fanatically opposed to the Church, its hold on the common people is still largely unshaken, and the women are devout adherents. There are some 8,800 churches and chapels in Mexico. In 1910 there were 15,000,000 Roman Catholics in the country, 69,000 Protestants, 33,000 of other faiths, and 25,000 professing no religion. The chief Protestant bodies are the Presbyterians, the Methodists, and the Baptists, and some years ago there were 210 Protestant missionaries working in the country, but their progress does not seem to be rapid. The Jews are numerically of small importance. The first non-Roman Catholic body in Mexico was the 'Church of Jesus in Mexico', which was started in 1868, and is housed in the old church of St. Francis; it is now governed by a body of canons, and has no missionary activities.

The Constitution of 1917 makes detailed provision in regard to the position of the Church. All places of public worship, residences of clergy, seminaries, asylums, convents, &c., are vested in the nation; places of worship are under

strict State supervision. Monastic orders are prohibited. Churches are forbidden to hold real property or loans. Only a Mexican by birth may be a minister of any religious creed. Ministers have no vote, are eligible to no office, and are prohibited from dealing, either in public speech or writing, with any political question. The State legislatures are given power to determine the maximum number of ministers of religious creeds according to the needs of each locality.

EDUCATION

From 1896 onward an attempt was made to institute a progressive system of education, which was made free, secular, and nominally compulsory for children between six and twelve years old, in the army, and in the prisons. A Superior Board of Education was set up as the administrative authority in the Federal District and the territories, with supervisory powers throughout the country, but the separate States exercise their discretion as to carrying out the national educational programme, and develop higher instruction along their own lines. No recent educational statistics are available, but in 1907 there were 11,940 elementary schools supported by the federation, States, and municipalities, with 776,622 pupils. There were also 2,499 private schools with 152,917 pupils. A large proportion of these schools were supported by Roman Catholic clergy and Protestant missions, but the Constitution of 1917 forbids the establishment or direction of primary schools by any religious body.

The Constitution lays down as one of the obligations of citizenship the duty of compelling children under fifteen years old to attend private or public schools to receive primary instruction and military training for such periods as the law of public instruction in each State may determine. But there have been and are obvious difficulties in the way of enforcing education, and it was asserted by a federal minister in 1916 that 80 per cent. of the population of Mexico is illiterate. Revolutionary opinion has attacked the landlord system which created the *peon* class and kept them practically

in serfdom, and the Roman Catholic Church which assisted to keep the masses in ignorance, as principally responsible for this condition.

Secondary instruction is organized as an intermediary step between elementary education and preparatory professional instruction, which is also uniform, free, and secular. In 1910 the old university of Mexico was refounded in the federal capital. The Government also maintains a number of special establishments, e.g. schools of law, medicine, agriculture and veterinary instruction, engineering, mining, commerce, music, and fine arts. There are also training schools for teachers and mechanics, schools for the blind and for deaf-mutes, besides the schools for the prisons and the army. The soldiers are largely illiterate Indians, who make good progress. In 1913 there were 151 libraries including the National Library in Mexico City with 200,000 volumes, 34 museums and 11 meteorological observatories.

Most of the children of educated parents are sent to Europe or to the United States to be educated.

In many primary schools, in addition to the usual subjects, English has been compulsorily taught, and there has been of recent years some spread of knowledge of that language.

SYSTEM OF GOVERNMENT

The following description of the system of government does not take account of any effects of the present internal situation upon its working.

According to the Constitution of 1917 (which differs from the preceding Constitution in a number of points, and in certain directions largely amplifies it), Mexico is a democratic, federal, representative republic, consisting of States, free and sovereign in all that concerns their internal affairs, but united in a federation. There are 28 States, two territories, and a Federal District, the former territory of Tepic having been created the State of Nayarit under the Constitution of 1917.

Federal Legislature.—The legislative power of the federation

resides in a Congress composed of (a) a House of Representatives, and (b) a Senate.

The House of Representatives is elected by direct manhood suffrage on a basis of one representative for each 60,000 of the population, or fraction exceeding 20,000, in each State and territory and the Federal District. A substitute for each representative is elected at the same time. Representatives must be Mexicans by birth, over 25 years of age, and natives of the State or territory which they represent, or domiciled therein for six months immediately preceding the election. For ninety days immediately preceding the election they must not have been in active service in the federal army, or have held command in the local constabulary or rural police, nor during that period must they have held the office of State governor, minister, or judge. Ministers of religion are debarred from membership of the house.

The Senate is composed of two members from each State and the Federal District, directly elected (along with a substitute for each) for four years, the senate being renewed in respect of one-half of its members every two years. Senators must be over 35 years old; otherwise the qualifications are the same as those for representatives.

The members of both houses are paid.

The Congress meets on September 1 each year in regular session, which lasts till December 31. The President may summon either house or both in extraordinary session. At the opening of each session he must present a written report. Legislation may be originated (a) by the President, (b) in either house of the Congress, save that legislature dealing with loans, taxes, and the raising of troops must originate in the House of Representatives, (c) by State legislatures. Bills rejected wholly or partly by the Executive require a two-thirds' majority to pass.

Congress has powers to admit new States, and to admit territories to statehood, under fixed conditions; to appoint superior judges throughout the Republic, and inferior judges in the Federal District and territories; to deal with taxes,

loans, and tariff laws affecting foreign commerce, and to enforce freedom of trade between the States ; to legislate for the entire Republic on all matters relating to mining, commerce, and institutions of credit. Congress also creates or abolishes federal offices, and confirms nominations, made by the executive, of diplomatic agents and consuls, and the superior officers of the treasury, army, and navy. It approves treaties made by the executive, declares war, and regulates the army, navy, and national guard. It legislates on all such general subjects as citizenship, naturalization, colonization, emigration, immigration, public health, communications, posts, currency, public lands, the diplomatic and consular services, and crime. Finally, Congress has power 'to sit as an electoral college and to choose the person to assume the office of President of the Republic, either as a substitute President or as a President *ad interim*'.

Each house has certain special powers. The House of Representatives can 'sit as an electoral college to exercise the powers conferred by law as to the election of the President' ; it also deals exclusively with affairs of the Treasury and the budget, and with charges against public officials. The exclusive powers of the Senate are concerned mainly with treaties, diplomatic representation, &c.

At times when Congress is not in session there is a permanent committee of 15 representatives and 14 senators, with limited powers ; its chief duty is to report to Congress on events and business done during the recess.

Federal Executive.—The President, elected in accordance with the electoral law of 1912, holds office for 4 years from December 1. He must be a Mexican by birth, and the son of parents who are Mexicans by birth. He must be over 35 years old, and must have resided in Mexico during the entire year preceding the election. He must not be a minister of religion, nor must he have held any position in the army or any executive office during 90 days preceding the election ; moreover the Constitution of 1917 lays down that he 'shall not have taken part directly or indirectly in any uprising,

riot, or military coup'. A President may never be re-elected, and in the event of a President's disability during his term of office, the acting or replacing President may not hold the ensuing term of office.

The President can appoint and dismiss the ministers of executive departments, governors of the Federal District and territories, and all federal employés in whose cases the Constitution does not specify the necessity for the approval of Congress.

The Federal executive is divided into such departments as Congress may appoint, under ministers. The departments are those of foreign affairs; the interior; *fomento* (industry, colonization, &c.); communications; public works; finance and public credit; war and marine. There were until recently departments of justice, and of public instruction and fine arts, but a 'transitory' article of the new Constitution abolished them. Ministers must be Mexicans by birth, and over 30 years old.

It should be added that the Constitution specially provides that the public health service shall be directly under the President, and possess its own executive powers, and that its general provisions shall be binding throughout the Republic. The powers of this department have been ingeniously used as a political weapon against revolutionaries, by prohibiting, under the guise of quarantine regulations, their passage from one locality to another.

State Government.—Each of the States is under a 'popular, representative, republican' form of government. The State governor, who must be a Mexican by birth, holds office for four years, and cannot be re-elected. The basis of the territorial division of the States, and of their political and administrative organization, is the 'free municipality', under a council directly elected by the people.

The Constitution does not specify the division of the States into districts, each of which included a number of municipalities, and was presided over by a *jefe politico*. This official, at any rate until recently, exercised very large powers,

and appointment to the office was commonly controlled, or at least materially influenced, by the Federal Executive.

Duties of Citizenship.—Service in connexion with elections, and the acceptance of municipal and other public elective office, are duties incumbent upon all Mexican citizens under the Constitution, without compensation, as also are military and jury service.

The Constitution prohibits titles of nobility, prerogatives, and hereditary honours.

Amendment of the Constitution.—The Constitution may be amended by a two-thirds' majority of Congress, with the approval of a majority of the State legislatures.

LEGAL SYSTEM

The judiciary consists of a supreme court and various circuit and district courts. The supreme court consists of eleven judges, Mexicans by birth and over 35 years old, possessing a legal qualification. They are chosen by Congress from among nominees of the State legislatures (one from each State). Circuit tribunals and district courts are distributed throughout the country. The federal tribunals take cognizance of (a) all controversies in connexion with federal laws, except when the interests of private persons only are affected ; in such cases local judges and courts have jurisdiction ; (b) admiralty cases ; (c) cases in which the federation is a party ; (d) cases arising between two or more States, or between a State and a resident or residents of another State ; (e) civil or criminal cases arising as a consequence of treaties with foreign Powers ; (f) cases involving diplomatic agents and consuls. The Supreme Court takes cognizance from the outset of controversies between the States and those in which the federation is a party ; it adjudicates as to jurisdiction between federal courts, between federal and State Courts, and between courts of different States, and in other cases as enumerated above it acts as a court of appeal or of final recourse.

An unique feature of Mexican jurisprudence is the writ of

amparo (protection), which combines the essential elements of the extraordinary writs of *habeas corpus*, *certiorari*, and *mandamus*. It is a federal procedure designed to give immediate redress when any of the fundamental rights of man are infringed by any authority, irrespective of category, or to excuse obedience to any law or decree which has invaded the federal or local sphere. It merely affords redress in a specific case, never involving any general statement of law, or declaring any law unconstitutional. Its use is extensive.

CHAPTER IV

HISTORY

The Colonial period—Spanish conquest and administration—Policy towards the Indians—Prosperity of New Spain—The War of Independence.

Independent Mexico before Diaz—Social conditions—Texas and the war with U.S.A.—The War of the Reform—French intervention and the empire of Maximilian—The rise of Diaz.

The dictatorship of Porfirio Diaz—Diaz's policy—The 'Científicos'—The causes of discontent—Unrest in the north.

The Revolution—Madero—The fall of Diaz—Madero in power, 1911–13—Zapata—Orozco—The elections of 1912—The fall of Madero—Huerta in power—The Constitutionalist rising—Huerta and President Wilson—Progress of the revolution—The leaders—The revolutionary programme—The fall of Huerta—The Convention of Aguascalientes and the war between Villa and Carranza—Mexico and the U.S.A.: the crisis of 1916—Internal situation, 1916–18—The Constitution and the presidency.

THE COLONIAL PERIOD

Spanish Conquest and Administration.—Mexico or New Spain was the first Spanish conquest on the American mainland (1519–21), and a regular administration was established there earlier and more peacefully than in the other parts of the New World. Even before the instalment of the first viceroy in 1535, Spanish occupation had extended far beyond the limits of the Aztec power, and by the end of the sixteenth century Spanish settlements were to be found as far north as Santa Fe in New Mexico.

The viceroyalty of New Spain with its seat at Mexico nominally included the kingdom of Guatemala, the Province of Yucatan, and the Philippines, as well as the kingdom of New Spain, but only the last was under the actual control of the viceroy. The condition of the inner provinces, which were thickly peopled and peaceful, was very different from that of the outlying territories, which were in a state of chronic war, and were usually administered by military

officers. The whole administration of the American possessions centred in the Council of the Indies at Madrid, on which the viceroy in spite of his enormous powers was entirely dependent. The council regulated every detail of economic and social life by its *cedulas*, and appointed practically all the officials, from the *corregidores* or governors of districts down to the customs officers. It also possessed the patronage and large powers of control over the Church.

From the first the colonization of the new country was strictly controlled by the Government. New Spain was regarded rather as a separate State united with Castile by a common allegiance than as a colony. The Spanish settlers and the Indians formed two separate polities which as far as possible were kept independent one of another.

In the early days of the conquest the Crown had rewarded the services of the conquerors by *encomiendas* or grants of Indian villages, which were in the nature of feudal fiefs, but the Government had no intention of allowing the settlers to become the heads of the native populations, and the *encomendero*, instead of living among his subjects like a chief, was bound to reside in the Spanish town of which he was a member. These Spanish towns possessed a communal organization and a large measure of self-government, though membership of the town council was generally an hereditary or purchased dignity. The Spanish settlers, or Creoles as they came to be called, thus tended to form a close privileged order with little share in the higher administration, but with considerable opportunities for enriching themselves.

In the course of time they acquired a strong local feeling and a jealousy of the European Spaniards, who held most of the important official posts.

In the first age of the conquest this distinction of course did not exist, and friction only arose from the insubordination of the Spaniards in New Spain towards their government in Madrid.

Policy towards the Indians.—This opposition was chiefly due to the attempt of the Council of the Indies to enforce the

laws for the protection of the natives, the abolition of slavery and the reform of the abuses connected with the *encomienda* system. The campaign of Las Casas against the wholesale exploitation and oppression of the Indians resulted in the promulgation of the New Laws (1543) which produced widespread disturbances among the Spanish settlers, but the council of the Indies did not relinquish its efforts, and the abolition of illegal serfdom and the reform of the *encomienda* system were largely carried out by the second viceroy, Luis de Velasco, and his immediate successors. It was the policy of the Spanish Government to preserve the old native communal organization. The Christianized Indians were grouped in large villages (*pueblos*) where they were under the immediate supervision of the *corregidor* or his agent and of the priest. These *pueblos* were endowed by the Crown with communal lands, and were under the authority of the *cacique* and two native *alcaldes* who were elected annually. No European, save the *corregidor* and the priest, was allowed to trade or even to reside in an Indian village. The organization of the *encomiendas* was similar save that the *encomendero* took the place of the *corregidor*. The Indian quarters of the large towns, such as Mexico itself, received a similar organization. This system undoubtedly saved the Indians from their worst oppressors, the Spanish settlers, and permitted them to survive and increase; it did not, however, prevent their exploitation by the *corregidor*, the *cacique* and the priest, who were all apt to use their authority in order to enrich themselves.

The extension of Spanish civilization and authority among the independent tribes, especially in the north, was carried out mainly by the religious orders who established missions in the course of the seventeenth and eighteenth centuries throughout the northern provinces of modern Mexico, as well as in Texas, New Mexico, and Upper California. The Franciscan missions in California are a famous instance of these 'reductions'. On the whole the unlimited power and influence of the missionaries seem to have been well used,

and their relations with the Indians compare favourably with those of the civil officials or of the secular clergy.

Prosperity of New Spain.—The kingdom of New Spain attained its greatest prosperity during the last century of the viceregal period. Under the viceroys Ursua (1771–9) and Revillagigedo (1789–94) Spanish influence extended far up the Pacific coast of North America. The inner provinces were the wealthiest and most peaceful of the Spanish possessions in America, and their artistic achievements, both in architecture and in painting, are the most remarkable in the New World.

The chief sources of wealth in New Spain were the silver mines of San Luis Potosi and Sonora. The whole trade with Spain passed through Vera Cruz, while that with the Philippines and China was monopolized by Acapulco.

Towards the end of the eighteenth century the cleavage between the Creoles and the European Spaniards became more pronounced, and a demand for some measure of independence was heard. The numerous governmental abuses, which sprang from excessive centralization, such as restrictions on trade, judicial delays and corruption on the part of officials, all gave occasion for discontent. Far the deepest source of disaffection was due to the fact that the officials who were enriching themselves at the expense of the colonists were for the most part Europeans. Loyalty to the Crown, however, was universal, and it was not until the Spanish Government had been overturned by Napoleón, that there was any movement of revolt in Mexico.

The War of Independence.—In September 1810 a great rising took place in Queretaro. Its leader, Hidalgo, a Creole priest, was a revolutionary idealist, but his followers were almost entirely Indians, who attacked Spaniards and Creoles indiscriminately, and had no political aims. Under Hidalgo's successor, Morelos, a *mestizo*, the ideal of independence was clearly set forward, but the movement was opposed by the Church and found little support among the Creoles. The revolt, which was marked by the ferocity which has always

accompanied Mexican revolutions, was suppressed by 1817, but the country continued in a state of unrest, and the Government had not the necessary resources with which to suppress the guerrilla bands.

The revolution of 1820 in Spain gave the final blow to the Spanish dominion in Mexico, for it destroyed the loyalty of the Conservative interests—the Church and the Creole wealthy class. It only remained to find a basis of union between the two parties, and this was performed by the Plan of Iguala which was promulgated in February 1821 by Iturbide, a Creole general, who had taken a leading part in the suppression of the earlier rising. The Plan of Iguala proclaimed the independence of Mexico as a limited monarchy under a Bourbon prince, with the two fundamental conditions of the maintenance of the Roman Catholic religion and the union on equal terms of Spaniards and native Mexicans. Under these conditions no resistance was made to the establishment of independence, and the new captain-general O'Donoju was forced to recognize the Plan of Iguala and to withdraw the few Spanish troops to Vera Cruz (August 1821).

INDEPENDENT MEXICO BEFORE DIAZ

As soon as the first Mexican congress met it was evident that the union of parties was only temporary. One party declared for the complete carrying out of the Plan of Iguala, the old revolutionary party favoured a federal republic, while Iturbide was determined to secure the supreme power for himself. He succeeded in declaring himself emperor in 1822, but republican risings broke out everywhere, and early in 1823 he was forced to resign.

The republican party was now in power, and in October 1824 a federal constitution based on that of the United States was promulgated. The territory of the new republic was more than twice as great as that of modern Mexico, since it included California, Arizona, New Mexico, Texas, Utah, and the south-western portion of Colorado; Guatemala, however, with the other central American States, which had

joined Mexico in 1822, seceded soon after the fall of Iturbide. The independence of Mexico was recognized by the United States and by Great Britain, and Spain was able to do little to maintain her claims, which were finally abandoned in 1839.

Social Conditions.—From the date of the establishment of the republic down to the present day the history of Mexico is an almost unbroken record of revolution and counter-revolution. The causes of this state of disorder lie deep and constitute the fundamental social problem of Mexico.

The attainment of independence found Mexico without national unity and without the material for a democratic régime. The whole political life of the country flowed from above, and the disappearance of external control paralysed society. The directing element both in Church and State had been Spanish, and the Creole aristocracy was lacking in virility, and was far less accustomed to responsibility than the corresponding class in the outlying territories of South America. The great mass of the people was utterly separated from the Creoles by race and civilization. The pure Indians largely out-numbered the remainder of the population and still to a great extent lived a self-contained life in their *pueblos*, affected only by the influence of the Church. The only approach towards democracy of which they were capable was their traditional village communalism, and this, as we shall see, was ruined by the work of the revolution itself. The Indians outside the *pueblos*, who worked—nominally for wages—on *haciendas* or plantations, were little better than serfs, and their condition after the declaration of independence grew worse rather than better in consequence of the disappearance of all government control. The rest of the population consisted mainly of half-castes (*mestizos*). The importance of this class has increased throughout the last century.

No true middle class existed apart from the officials and lawyers, whose numbers and influence continued to increase throughout the period of disorders.

This heterogeneous society was divided from the first into two political factions, one of which represented the colonial

tradition, and was conservative in principles and favoured a strong central government, while the other was under the leadership of men who had taken part in the struggle for independence, and advocated liberal ideas, and local state autonomy.

During the first period of independent Mexican history (1821-54) the Centralists, who were supported by the upper class and the higher clergy, were on the whole predominant. The influence of the Church, which had retained the wealth and privileges that it had possessed in viceregal times, was enormous, but it had depended even more than the rest of society on Spain, and when left to itself it was entirely lacking in energy and political ability.

The Creole aristocracy also tended to avoid direct political responsibility. The confiscations and savage reprisals which had accompanied every revolution since 1810 caused all who had anything to lose to remain neutral. Rich men would secretly finance a rising, when the Government in office proved unbearable, but they would themselves remain in the background. In this way politics became the domain of soldiers of fortune and the lawyer class. The insurrectionary movement of 1810 to 1821 had accustomed the country to endemic guerrilla warfare and had created a large class of irregular soldiery who lived by war and plunder.

Thus no materials existed in Mexico for a true democratic party, and the struggle of factions usually tended to be no more than a contest between 'Ins' and 'Outs' for the enjoyment of office. The 'spoils' system was so strongly developed in Mexico that a successful revolution brought with it a general change of officials throughout the country, and thus involved important economic issues for a country without industry or trade. Revolution was indeed the one path to wealth and social advancement, and the cult of the heroes of the War of Independence (which was in reality the first civil war) had rendered it thoroughly respectable.

Throughout Mexican history from the time of Hidalgo to that of Madero, a small class, generally Creole, has existed,

which has had a genuine enthusiasm for extreme liberal principles, and this class has provided the figure-heads, and composed the programmes for the successive revolutionary movements.

Instead of producing a strong aristocratic government the predominance of the Centralists only resulted in the erratic and intermittent dictatorship of Santa Anna, a Creole officer who had served on the loyalist side during the War of Independence. Under his rule the federal constitution was abolished (1835-6), and replaced by a Centralist form of government, which included a property qualification for electors and representatives.

Texas and the War with U.S.A.—This movement towards centralization met with strong opposition in Texas, where there was now a considerable number of settlers from across the United States border. The latter resented the control of the Mexican Government and were especially hostile to the Mexican laws against slavery. In 1835 Texas declared its independence, and the Mexican forces under Santa Anna were eventually defeated and forced to surrender by General Sam Houston (Rio San Jacinto, 1836). The Mexican Government refused to ratify Santa Anna's recognition of the Texan demands, but for the next nine years the State enjoyed *de facto* independence. In 1845, when Santa Anna had been temporarily displaced by Herrera and Paredes, a crisis arose owing to the admission of Texas into the American union. The Mexican army was defeated at Palo Alto and Resaca in Texas, and Mexico was invaded by three American forces. The most important of these, under Taylor, marched from the Rio Grande on Monterey, and afterwards defeated Santa Anna, who had returned from exile to take charge of the war, at Buena Vista (February 1847). As the Mexicans were still defiant, it was determined to make a direct attack on the capital from Vera Cruz. In March 1847 General Scott besieged and took Vera Cruz and began his march on Mexico. After defeating Santa Anna at Cerro Gordo, he was forced to await reinforcements at Puebla. In three months the

advance was resumed, and after a number of engagements, Mexico City was taken by storm in September 1847. Meanwhile New Mexico and Upper California had been occupied largely by irregular troops. Early in the following year Mexican resistance came to an end, and on February 2 the treaty of Guadalupe Hidalgo was signed.

By this agreement Mexico surrendered all her northern territories—Texas, New Mexico, and Upper California—to the United States and received in return the sum of fifteen million dollars. Her government had proved quite unequal to the control of these vast and thinly peopled regions, out of which, had the United States abstained from aggression, independent states would eventually have been formed. Nevertheless the blow to national prestige and racial feeling caused by their annexation left bitter resentment in Mexico and coloured all the subsequent relations between that country and the United States.

The present frontier line was completed a few years later by the sale to the United States of the valley of the river Gila in Arizona.

After the American War the strife of parties was resumed. Santa Anna continued to be the dominating personality, and in 1853 he seemed on the point of reviving the imperialist régime of Iturbide. In 1854, however, a strong federalist movement was launched by the *pronunciamiento* at Ayutla, and in the following year Santa Anna was forced to leave the country. His fall marks the end of the Conservative régime.

The War of the Reform.—The struggle that occupied the following years was of a far more serious character than the ordinary revolutions, in which the greater part of the people were uninterested spectators. It involved not only political changes, but also the destruction of the social system which had been inherited by Mexico from the colonial period. It had long been obvious that the ultimate struggle between the Liberal Federalists and the Conservative Centralists would centre round the question of the Church. Already in 1833

the power of the Church had been greatly weakened by the secularization of the missions and the expulsion of the Spanish clergy, but since the fall of Gomez Farias in 1834 the privileges of the Church had remained untouched. The government of Comonfort, Juarez, and Lerdo, which succeeded Santa Anna, determined on a vigorous anti-clerical policy, and in 1856 the important Ley Juarez was enacted, which provided for the compulsory sale to the tenants of all real property held by corporations. This measure applied not only to the property of the Church and the religious orders, but also to the common lands of the towns and the Indian villages, thus involving a real economic revolution. The hostility of the Church and of the Conservatives was still further aroused by the promulgation of the new constitution of 1857, which was a return to the anti-centralist principles of 1824, and provided for the separation of Church and State.

In 1858 a Conservative *coup d'état* drove the Liberals from Mexico City, and Juarez, who had succeeded Comonfort in the leadership of the party, ultimately set up his government at Vera Cruz. During the following years civil war, complicated by Indian risings, raged throughout the country, and Juarez was hard pressed by the Conservative leaders Miramon and Marquez. In 1859, when his prospects were darkest, he struck a final blow against the Church by the enactment of the Reform Laws, which have given their name to the whole struggle. By these laws it was made illegal for the Church or any religious corporation to hold property. All endowments were confiscated. The religious orders and the lay confraternities were dissolved, and marriage and burial were to be exclusively civil ceremonies. Owing to the political situation these laws were not completely enforced till after 1867.

French Intervention and the Empire of Maximilian.—In 1860 the Liberal forces began to gain ground, and by the end of the year the Conservatives were forced to abandon the capital. The victory of Juarez, however, was quickly followed by foreign intervention. Foreign claims against the Mexican

Government had been accumulating during the period of disorder, and Juárez's decision to suspend payment on the foreign debt gave the European Powers a final excuse for intervention. At the end of 1860 Vera Cruz was occupied by a Spanish force, which was soon joined by British and French contingents. Meanwhile Napoleon III had decided to take advantage of the powerlessness of the United States and of the appeal of the Mexican exiles, in order to set up a Latin-American empire which would counterbalance the Anglo-American power of the north. In 1862 Great Britain and Spain withdrew their forces, and the French army began to move on Mexico. On May 5 it met with a reverse before Puebla and was forced to wait till the next year to resume its advance. In May 1863 General Forey took Puebla after several weeks' fighting, and entered Mexico City on June 7. The Conservative provisional government which was installed at once offered the crown to the Archduke Maximilian, the brother of the Emperor of Austria, who was the candidate designated by Napoleon.

When the new emperor arrived in Mexico in the summer of 1864, the centre of the country was occupied by his forces. Juárez had his head-quarters at Paso del Norte, and in the south Porfirio Díaz held Oaxaca. Maximilian made a genuine effort to give peace and good government to Mexico and to deal impartially with the different parties, but the difficulties of the situation were too great for either his ability or his resources, and the republicans continued to maintain a guerrilla warfare in many parts of the country.

The close of the civil war in 1866 left the United States free to turn their attention to the Mexican question, and in consequence of their representations, Napoleon III was induced to withdraw the French troops in February 1867. Maximilian's situation was now hopeless, but he determined to continue the struggle at the head of the Mexican Conservatives. On April 2 General Díaz captured Puebla, and in the following month Queretaro, where the Emperor was besieged, fell into the hands of the republicans. On June 19,

1867, Maximilian and the two Conservative leaders, Miramon and Mejia, were executed, and on the following day the capital surrendered to General Diaz.

The Rise of Diaz.—The victory of Juarez was far from restoring peace to the country. The years after 1867 witnessed a continuous succession of risings and disorders. Not only were there a number of serious Indian revolts, some of them racial and others religious in character, but the Liberals themselves divided into factions which soon came to open strife.

The Liberal opposition found a leader in Porfirio Diaz, the ablest of the young generals, a *mestizo* of humble origin. He rose unsuccessfully against Juarez in 1871, and after the death of the latter carried on a campaign of political intrigue and open revolt against the new president Sebastiano Lerdo.

In 1876 Diaz finally succeeded in defeating his rival, and was elected president in the following year. His programme—the Plan of Tuxtepec—proclaimed the exact observance of the Constitution of 1857 and of the Reform Laws and the ineligibility of president and state governors for re-election. It is noteworthy that these two principles were also the bases of the modern revolution; the first being in the programme of Carranza in 1913 and the second in that of Madero in 1910.

THE DICTATORSHIP OF PORFIRIO DIAZ

During his first term of office, 1877–80, Diaz's government had not the purely personal character that it afterwards assumed. He did not break with the section that had raised him to power until the end of his term of office, when he threw over the party candidate, Benitez, and procured the election of Fernando Gonzalez. During the presidency of the latter, Diaz kept the real power in his hands and in 1884 he returned to office. Henceforward he held the presidency without a break until his fall in 1911, the law against re-elections being repealed in 1887.

Diaz's Policy.—Diaz aimed from the first at setting up an efficient dictatorship under which economic development

would be possible, and which would gain the good opinion of foreign statesmen and capitalists. To this end he reorganized the *guardias rurales*, a force of mounted police, who were capable of dealing with guerrilla fighters, and mercilessly suppressed the brigandage and disorder which had become endemic. Although he remained in theory faithful to the Liberal programme, his policy after 1884 was in fact a revival of Centralism in a stronger form than had ever been known before. He maintained close relations with the state governors, and through them controlled the *jefes politicos* who administered the districts. No outside interference was possible, since the elections were entirely in the hands of this administrative hierarchy. The governors, however, were not merely the president's creatures. Many of them, especially in the northern provinces, had established themselves as independent after 1867, and it was the policy of Diaz to admit them to partnership and treat them generously.

The economic development of the country made rapid progress after the completion of the Central Railway in 1884, by which Mexico was connected with the United States. Diaz devoted very large sums to subsidizing the construction of railways, and to the construction of ports and other public works, the most important of which was the drainage of the valley of Mexico, a work which was completed in 1903.

The reorganization of the Mexican finances was almost entirely the work of Señor Limantour, who became secretary of the Treasury in 1893. By his efforts the deficit in the national revenues was abolished, and Mexican credit reached a level unparalleled among Latin-American states. With regard to the central government and the legislature, Diaz followed the maxim 'little politics and much administration', and he freed himself more and more from party control in the choice of officials, although the Liberals more or less maintained their monopoly until the appearance of a new party in 1892.

The ' Cientificos '.—This group, known as the ' Cientificos ', was led by Señor Limantour and advocated a policy of social

and economic development together with the maintenance of the dictatorial régime. In time its character changed from that of a political party to that of a group of officials centring in Limantour and representing the new bureaucracy. All the interests that favoured the maintenance of order and a strong administration gathered round this centre, and thus a new Conservative party arose, which was on friendly terms, if not in alliance, with the old Conservatives who had been so long outside politics.

The president himself continued to maintain in theory the liberal and anti-clerical principles of his early days ; nevertheless, influenced partly by policy, partly by his second wife, a Creole of good family, he adopted an attitude of toleration towards the Conservatives and towards the Church, and abandoned the policy of proscription which had obtained from 1867 to 1885. After 1898 Catholics were readmitted into public life, although they remained in strict personal dependence on the dictator.

These changes aroused great indignation among the Liberals, who saw their monopoly disappearing and their principles threatened. Moreover after 1900, the question of the succession became pressing, and although no party was bold enough to suggest the withdrawal of the president, the Liberals were determined to provide a successor. The chief opponents of the Científicos were Baranda, the Minister of Justice, Dehesa the governor of Vera Cruz, and Reyes, the Minister of War, and governor of Nuevo Leon. The last was the Liberal candidate, and after 1901 a vigorous campaign was conducted in his favour and against the Científicos.

The dictator himself rather encouraged these hostilities, since it made his own indispensability more apparent. He was determined to remain in power to the end, and he seems to have had little thought for what was to come after. Yet although the open expression of discontent by either the press or the people was mercilessly suppressed, the dictatorship, after more than twenty years' unbroken rule, was everywhere becoming unpopular.

The Causes of Discontent.—Much of the opposition, especially that of the Reyes party, was factional and due to provincial feeling and personal ambitions and jealousies. Nevertheless deeper grounds for discontent existed in the misgovernment and exploitation of the people.

It is undeniable that the government, which at its centre, in the hands of men like Limantour, Mariscal, and Leandro Fernandez, was able, well-intentioned and uncorrupt, rested ultimately on the venal and oppressive rule of the commissary of police and the *jefe politico*. The actual government of the country was in the hands of the *jefe*, who was nominated by the state governor and was all-powerful within his district. He controlled the police, the elections, the local administration of justice, and the levy of conscripts, the last especially being used as an instrument of oppression. The system, however, was not of Diaz's invention; it had existed with all its abuses long before his time, and it continued to exist after his fall in spite of the promises of the reformers.

In the same way the land question was a heritage from an earlier period. The great self-contained estates (*haciendas*) had always been typical of Mexico, but before 1856 they had been far outnumbered by the villages which possessed extensive common lands (*egidos*). Under the Law of Disamortization (1856) the common lands were enclosed at the same time that the Church lands were sold. This caused a general redistribution of property, for the Indians failed to maintain their separate holdings, and the land was bought up by middlemen and village moneylenders, or was, it is said, appropriated by dishonest officials. Ultimately much of these lands came into the hands of the large landowners, but the greater part was devoted to cattle farming; the *rancheros*, who were sometimes owners, sometimes tenants of the large landowners, occupying a middle place in Mexican society. There remained a certain number of villages in the more remote parts of the country, especially in Michoacan, which retained their *egidos* undivided, and the Diaz administration was accused of having procured the wholesale alienation of

these lands in recent years to the great landowners and still more to foreign land companies. Thus the Indians and peons became to a great extent a landless class in spite of their strong attachment to the soil. They were deeply indebted to the planters for whom they worked, as well as to local moneylenders and shopkeepers, and their condition in many states was one of actual serfdom. Things were worst in the tropical plantations, where the inducements to exploitation were greatest. In the central provinces north of Morelos, where the land is largely farmed on the *metayer* system, in spite of the complete dependence of the peon, their relations with the landowners seem to have been good.

In districts where the Indians had preserved their tribal organization the land question was complicated by racial war. This was above all the case in Yucatan, where the struggle of races was carried on ferociously throughout the nineteenth century, and is still not extinct. The Yaqui war in Sonora was less important, and less justifiable, and the wholesale deportation of Yaqui prisoners to the plantations of Yucatan was among the scandals of the Diaz system which aroused indignation in the United States. Apart from Zapata's movement in Morelos, discontent aroused by the land question and the political and economic exploitation of the Indians were not direct causes of the revolution, which was made by a different class. They did, however, produce general unrest, and the fall of Diaz was followed by widespread social disturbances, the burning of *haciendas*, and the murder of unpopular individuals, especially Spaniards and Chinese.

Unrest in the North.—In the northern provinces the land problem was of a different character. Here there were great stretches of uninhabited country which became valuable only after the development of railways. The state governors and others who possessed influence were able to use their position to acquire large estates, under the law for the public disposal of waste lands (*tierras baldias*). The case of General Terrazas, Governor of Chihuahua for many years, who had become possessed of a large part of the state and had made an enor-

mous fortune from cattle-raising, was especially notorious, and the concession of large tracts to American land companies also caused great discontent.

Many other reasons existed for the hostility of the northern states to the Diaz régime.

The favour that Limantour always extended to British and American capitalists and the number of foreign concessions was everywhere the main accusation against the Government in the last days of the dictatorship, and it was naturally felt most strongly in the north, where foreign enterprises were most developed and where anti-American feeling was traditional. A new society had grown up, unlike that of the unchanging central provinces, and the upper classes and the Church were without influence and unpopular both with the ranchmen and the new industrial class. Anti-centralist, anti-clerical and anti-foreign feeling were all strongest in the north, and consequently the revolution has been throughout a predominantly northern movement.

In 1908 a great impulse was given to political agitation by President Diaz's celebrated interview with the American journalist, Creelman, in which he announced insincerely that he proposed to retire from public life on his completion of his term of office and that he welcomed the creation of an independent democratic party. This declaration encouraged the Liberals to found the Democratic Party, and in 1909 it seemed certain that their candidate, General Reyes, would be elected to the vice-presidency. However, when it became clear that the president had no intention of laying down the dictatorship, Reyes to the disgust of his party at once submitted, and shortly afterwards obeyed the president's command to go on a mission to Europe.

THE REVOLUTION

Madero.—At this point a hitherto unknown personage came to the front, Francisco I. Madero, member of a wealthy Creole family of Monterey. Early in 1909 he began a campaign against successive re-elections to the presidency.

At first the new movement was disregarded by the dictator, but in June 1910, after Madero had actually been put forward by the anti-re-electionist party as a candidate for the presidency, Diaz had him arrested, and he was in some danger of losing his life.

In October when the re-election of Diaz and of Ramon Corral, the vice-president, had been completed, Madero escaped to Texas, and there published the Plan of San Luis Potosi, calling upon the nation to rise against the dictator, and outlining his programme of reform. Madero was without resources or powers of organization, and his *pronunciamento* was only saved from complete failure by a rising in Chihuahua. The insurgents, who included Pascual Orozco, Francisco Villa, and Abraham Gonzalez, obtained several small successes, and the weakness of the Federal army, which had declined in numbers, equipment, and efficiency during the long peace, was at once apparent.

The Fall of Diaz.—The dictator was now very feeble, and in the absence of Limantour, the whole conduct of affairs was weak. In March Limantour returned, and a new cabinet was installed, but it was apparent that the policy of the government was to be one of conciliation. This seems to have been chiefly due to Limantour's fear of the intervention of the United States, but there was also a strong party among the governing class who wished to avoid at all costs a long civil war and the relapse of the country into the state of anarchy from which Diaz had raised it. Already there were serious risings in Zacatecas and in the south, and brigandage and disorder were breaking out everywhere.

The capture of Ciudad Juarez by Orozco on May 10, 1911, destroyed the prestige of the Government, and insurgent successes in other parts of the country followed rapidly. Limantour was determined to save what still could be saved, and on May 22 a convention was signed by which hostilities were brought to an end. The president and the vice-president were to resign, and a provisional Government under Señor de la Barra was to be formed under which the election of

a new president could be held. Three days later Porfirio Diaz left the country.¹

In spite of its ignominious ending, the absolute government of Diaz had lasted longer and been more successful than that of any other Latin-American dictator. Its faults were those common to all the South American States, whilst in finance and in the economic development of the country it was incomparably more efficient. The dictator had, to the end, preserved considerable personal popularity. The unpopularity aroused by his later régime was concentrated far more on the Científicos than on the President, although the main charge against the former—that they were destroying the resources of the country by foreign exploitation—was an absurd exaggeration. The true faults of the Diaz régime—its ruthless severity, its injustice towards the weak and its suppression of all free political life—were directly due to the dictator himself.

Madero in Power, 1911-13.—Francesco I. Madero, who was elected President on October 2, 1911, with Pino Suarez as Vice-president, was in every respect a contrast to his predecessor. He was a sincere idealist who really believed in his mission to restore freedom to Mexico and in the practicability of free elections and an impartial judiciary. He was anxious to conciliate all parties, and disgusted his northern supporters by his moderation towards the defeated. Through his family he was in touch with the ruling class of the old régime, and he made no general change in the administrative officials. Gustavo Madero, who was his brother's political manager both during the revolution and after his advent to power, was a man of a completely different type who employed to some extent the violent and corrupt methods of the Diaz system in support of the new régime. His power was based on the extreme democrats, while the rest of the family were Conservatives.

Zapata.—The new Government failed utterly to put an end to the disorder which had broken out everywhere on the fall

¹ He died in Paris on July 2, 1915.

of Diaz. In the south Zapata, whose followers were chiefly Indians, and who demanded the division of a third of the arable land amongst the peons, was supreme in Morelos, and there was another serious rising in the Isthmus of Tehuantepec.

Orozco.—In the north General Reyes's attempt at the end of 1911 was a complete failure, but in the following spring a far more serious rising under Pascual Orózco and Vasquez Gomez broke out in Chihuahua. Their party included many of the leaders of Madero's rising, and in a short time Orozco had made himself master of the whole state. However, in May the Federal forces under General Huerta inflicted some severe defeats on the insurgents and after July they were reduced to guerrilla fighting.

The Elections of 1912.—In October 1912 the new Congress met—the result of the first free election that had taken place for at least a generation. The official Government party, known as the Constitutional Progressive party, was under the management of Gustavo Madero, but the President had also encouraged the formation of the National Catholic party under the leadership of Señor Gamboa, which was to play the part of an official opposition. There were in addition several independent parties.

Although the elections were free the final results were said to have been manipulated by Gustavo Madero so as to leave 190 out of 232 seats in the hands of the supporters of the Government. The voting, however, had shown that the Catholics were still extremely strong in the thickly populated central states in spite of sixty years' exclusion from public life, and henceforward the Church was looked upon by the revolutionaries as one of their most formidable enemies.

The Fall of Madero.—By the autumn of 1912 the situation of the Government had become very precarious. The President had quite lost his popularity with the Liberals, while Gustavo had aroused the hatred of the official classes and of the supporters of Diaz.

On October 23, 1912, the attempted rising of Felix Diaz, nephew of the dictator, at Vera Cruz was crushed and its

leader captured. Thus the two chief opponents of Madero, Felix Diaz and General Reyes, were both prisoners; it is characteristic of the moderation of the President that neither of them was executed.

On February 9, 1913, General Mondragon at Tacubaya declared against the Government and marched on Mexico. Diaz and Reyes were released and the citadel was captured. Reyes, sent to take Madero prisoner, was shot, and in the fighting which followed many of his supporters were killed. For several days street fighting went on (the period is known as the *decena tragica*), and it became apparent that General Huerta, the commander of the Government troops, was intentionally avoiding a decision.

Huerta in Power.—A meeting was finally arranged between Huerta and Diaz by the mediation of H. Lane Wilson, the United States minister, and it was agreed that Madero should be forced to resign and that Huerta should assume the presidency provisionally until Diaz should be formally elected.

On February 18 the President, Pino Suarez, and Gustavo Madero were arrested. Gustavo was immediately executed, while the other two were shot by their guards on February 23 while they were being removed from the palace to prison.

It was now evident that Huerta did not intend his dictatorship to be provisional. Felix Diaz soon afterwards escaped to Europe, and, of the other possible candidates for the presidency, the younger Reyes was imprisoned and De la Barra was sent on a foreign mission.

The new dictator was at once recognized by Congress and by the States, and foreign financial interests were strongly in his favour. The country as a whole was ready to submit to any power which could preserve order, and only in the frontier provinces of the north was there any sign of open resistance. Abraham Gonzalez, governor of Chihuahua, General Maytorena, governor of Sonora, and Venustiano Carranza, governor of Coahuila, all held back from recognizing the new Government. It is doubtful whether their hesitation would

have had any important result had not Huerta driven them to desperation by the murder of Gonzalez, who had just withdrawn his opposition. Maytorena thereupon fled to the United States and Carranza launched the revolution by issuing the 'Plan of Guadalupe' (March 28, 1913).

The Constitutionalist Rising.—The rising in Coahuila was a failure, the insurgents being defeated at Anheló, and Carranza was forced to cross the frontier into Texas. In Sonora, however, the movement had much greater success. The State legislature was on the side of the insurgents, as well as a considerable number of regular troops under Obregon, Alvarado, and Hill. The warlike Yaquis also gave valuable aid.

On April 1 Obregon took Naco on the American frontier, and in the following month defeated General Barron north of Guaymas. In July, after the Federals had again been defeated, he was able to move south slowly towards Sinaloa.

Meanwhile the famous guerrilla fighter Villa (below, p. 91) had crossed the frontier, and had begun to raid Chihuahua and Durango. The progress of the revolution was largely due to the favourable attitude of the United States Government, which had from the first steadfastly refused to recognize Huerta on account of the murder of the Maderos.

Huerta and President Wilson.—At first the position of the dictator was strong, since his Government was recognized by the European Powers, and his control of the country was almost complete. But the goodwill of the United States was essential if the revolution in the north was to be suffocated, and by degrees the hostility of President Wilson began to affect the internal situation.

In July 1913 the United States minister H. Lane Wilson, who had always been friendly to Huerta, was recalled, and in August a special envoy from Washington, Senator Lind, visited Mexico and formulated the American demands, which were the resignation of Huerta and the holding of free presidential elections.

The Mexican Government in reply pointed out that the

provisional president was by the Constitution forbidden to offer himself for election, and on the reassembly of Congress in September Huerta promised that free elections should be held in the next month. The Maderist majority in Congress, encouraged by the progress of the revolution, now began to show signs of insubordination, and on October 10, 1913, the dictator forcibly dissolved Congress and imprisoned 110 of its members. This called forth another protest from President Wilson, who declared that he could not recognize the result of the forthcoming elections. The three candidates were Felix Diaz, Señor Gamboa, and Señor Calero, a Liberal. General Huerta had given a solemn assurance to the *corps diplomatique* that he would not submit his candidature; nevertheless when the results were made known, it appeared that he had received a majority of the votes. It was finally decided that no candidate had received the requisite proportion of votes and that the provisional presidency should continue until July 1914, when new elections should be held.

Progress of the Revolution.—During the autumn the revolution had made further progress in the north. In October Villa had defeated the Federals near Torreon and sacked the town. In November he surprised Ciudad Juarez, defeated the force which came to its relief, and finally occupied Chihuahua. The revolutionary attacks on Monterey and Tampico failed, but all the north-west was in their hands, and Carranza was able to establish his provisional government in Hermosillo.

The new revolution, even more than that of 1910, was a local movement of the three northern states, Sonora, Chihuahua, and Coahuila, and it was far more military and uncompromising in character than Madero's movement had been. It did not include the party of Orozco, which now fought on the side of Huerta.

The Leaders.—Its principal leader, Venustiano Carranza, had been a supporter of General Reyes and had received the governorship of Coahuila through his influence. In 1911 he had taken an important part in the Maderist movement.

Unlike Madero he was a good party organizer, and the success of the new revolution was largely due to the care and completeness with which he substituted an entirely new personnel composed of his followers, in each district as it was occupied by the revolutionary forces. He was as consistent in his severity towards his opponents, as in his fidelity to his supporters, and although he had none of the ferocity of Villa, he revived the barbarous treason law of January 1862 which imposed the death penalty on all the supporters, whether combatant or non-combatant, of the *de facto* Government.

Francisco Villa, otherwise Doroteo Arango, the other important chief, was a half-caste of the *peon* class and had been a noted bandit in the days of Porfirio Diaz. His skilful and daring leadership, especially in irregular fighting, probably contributed more to the success of the revolution than the more orthodox talents of Obregon and Gonzalez. He carried on war with a barbarity unknown even in Mexico, killing and plundering without regard to politics or nationality. A Constitutionalist writer states that during his occupation of Chihuahua, December 1913–March 1914, he executed more than 500 civilians unconnected with the Government, including the Englishman, Benton, and his expulsion of the large numbers of Spanish subjects in the Torreon region together with the confiscation of their property caused subsequent difficulties between Carranza and the Spanish Government.

The Revolutionary Programme.—The Constitutionalist programme was of an extremely revolutionary nature. It included national ownership and control of land and natural resources, the solution of the land question by the division of large estates and by the return to the villages of all common lands sold or confiscated, and the introduction of numerous social reforms, such as the minimum wage and the eight hours' day. Moreover the Constitutionalists maintained that political and economic reforms were not sufficient; in order to make Mexico a true democracy, the mass of the population, which had always remained outside political life, must be

freed from undemocratic influences. Hitherto the one organization that really affected the *peon* class was the Church, and it was therefore necessary that the influence of the Church should be utterly and finally suppressed, and that the political menace of a Catholic vote should be rendered impossible. This end was to be attained by the prohibition of all religious education, whether public or private, the confiscation of all Church property, and strict Government supervision of the clergy. The action of the Constitutionalist leaders went far beyond this official programme, and the victory of the revolution was followed by a campaign of extermination against the Church, the higher clergy being driven out of the country, the churches in several States being closed, and many members of the clergy and the religious orders being executed or imprisoned. During the confused period of civil war after 1914 several religious risings broke out in districts where the anti-clerical measures had been most severe, especially in Michoacan. The rising in Oaxaca seems also to have been partly religious in origin.

The Fall of Huerta.—In the middle of March 1914 Villa resumed his campaign, entering Torreon on April 2 after very heavy fighting. Soon afterwards Monterey and Saltillo fell into the hands of the Constitutionalists.

In February President Wilson had taken a further step against Huerta by raising the embargo on the export of arms in favour of Constitutionalists only, and the arrest of some American marines by Federal troops at Tampico gave him an opportunity for active intervention. On April 21 Vera Cruz was occupied by an American force after some fighting.

It is possible that Huerta hoped that open hostilities with the United States would have rallied the country in his favour. Carranza, however, contented himself with a formal protest and redoubled his efforts against the Federals. The capture of Tampico on May 13 dealt a severe blow to Huerta by depriving him of his base in the north and of his chief remaining source of revenue. He now only possessed one outlet on the Atlantic coast, Puerto Mexico, through which

he received a large consignment of arms at the end of May by the Hamburg-Amerika line.

His situation had become desperate, and he at once accepted the mediation proposals of the Washington representatives of Brazil, Chile, and Argentina. On May 20 the mediation conference was opened at Niagara. It was suggested that Huerta should resign, and that a Government should be formed under a provisional president nominated by Huerta which should hold office until a new Government, pledged to reform, should be installed. This plan, however, was wrecked by the refusal of Carranza, supported by President Wilson, to recognize any Government appointed by Huerta, or including any of his supporters.

It was indeed obvious that the Constitutionalists were now masters of the situation. Obregon had advanced down the Pacific coast to Tepic and Guadalajara, Villa had taken Zacatecas with great slaughter, and the United States had forced Huerta to relinquish the blockade of Tampico. On July 5 Huerta abandoned Mexico,¹ leaving the Government in charge of Señor F. Carbajal as provisional president. The new Government was helpless, for the army was on the verge of mutiny, the capital was threatened by the forces of Zapata, while Carranza, who was at Saltillo, refused to enter into negotiations and condemned the members of the new administration to death. However, on August 15 the capital was occupied without fighting by Obregon and Carranza, the Federal army being withdrawn to Puebla, where it was disbanded.

The Convention of Aguascalientes and the War between Villa and Carranza.—Before the victory of the revolution was completed a new war had broken out among its partisans. In August the governor of Sonora, Maytorena, supported by the Yaqui Indians, rose against Carranza. Obregon succeeded in effecting a temporary reconciliation at Nogales, but on his

¹ He fled at first to Spain, then, returning to the United States, he made an attempt, with Orozco, to enter Mexico and raise a revolution in June 1915. They were arrested by American officers: Orozco escaped, but was killed during a raid on the frontier: Huerta was imprisoned and died, shortly after his release, in January 1916.

departure Villa, who since June had been showing open insubordination to Carranza, allied himself with Maytorena and took up arms.

The new party consisted of the most diverse elements, its most important members being Generals Villa, Angeles, Blanco, Maytorena, and afterwards Zapata. All were united in a determination to get rid of Carranza and to keep the direction of the revolution in the hands of the military leaders. The armies of the north-west and the north-east under the command of Obregon and Gonzalez remained faithful to Carranza.

A conference between the two parties was held at Zacatecas, and it was decided that a National Convention should be convoked at Aguascalientes, consisting of 154 military delegates chosen by the army commanders. In this conference Zapata for the first time came into relations with the revolutionary leaders.

The Convention decided almost unanimously that Carranza should resign. The latter agreed to withdraw if Gonzalez was chosen president, but negotiations were stopped by Villa, Angeles, and Zapata gaining complete control of the assembly. The Constitutionalist leaders withdrew to Cordoba, Orizaba, and finally to Vera Cruz, where Carranza established his provisional Government after the withdrawal of the American forces on November 23. The Convention declared Eulalio Gutierrez provisional president, and Villa and Zapata occupied Mexico City in his name.

In 1915 the disorder of the revolution reached a climax, the fighting between the rival factions was far more sanguinary than that during the war with Huerta, and the destruction of property was greater. The country also suffered severely from famine and disease.

In January Villa's provisional president declared against him and fled from Mexico City. He was succeeded by Gonzalez Garza, who followed his example as soon as Villa's army left the capital (January 27), and Obregon reoccupied it for Carranza.

The north was at this time almost entirely in the hands of the Conventionalists. In Sonora the remains of the Carranzist forces, after their defeat by the Yaquis at Cananea, were besieged for more than three months by Maytorena at Naco on the Arizona frontier, until the protests of the United States Government and its concentration of troops forced both parties to abandon operations (January 1915).

In the south a serious rising had broken out in Oaxaca, in which Carranza's brother, the Constitutionalist commander, lost his life. The power of Zapata extended from Morelos and Guerrero throughout the neighbouring States.

The strength of both Villa and Zapata, however, lay in their irregular troops. By degrees the superior organization of the Carranzista armies told in their favour, and in the course of the year they gradually reoccupied the central parts of the country. On March 10 Obregon began to move north against Villa, although this necessitated his abandoning the capital to Zapata. He occupied Queretaro without difficulty, and a week later came into contact with the main Conventionalist army near Celaya. Two heavy engagements were fought on April 5-6 and 13, in which Villa was defeated and forced to retire northwards. Early in June a decisive victory was gained by Obregon after five days' fighting south of Leon in Guanajuato. Villa retreated to Torreón, and afterwards to Chihuahua. At the same time a strong Conventionalist army under General Urbina, which had been attempting to capture Tampico, was driven back by General Treviño after more than a month's fighting at El Ebano (March 21-May 31).

Meanwhile General Gonzalez had begun a campaign for the recovery of the capital from Zapata. In the course of his operations during June and July Mexico City was almost surrounded, and was reduced to great straits from lack of food. After numerous engagements Zapata was forced to retire to the south-west, and on July 25 the city was occupied by Gonzalez. A Red Cross Mission was dispatched from the United States in order to take measures for the relief of the inhabitants, but was subsequently withdrawn.

The campaign in the north continued satisfactorily. Monterey, Saltillo, and Torreon were re-occupied by the Carranzists, and by the autumn Villa was driven into the Sierra Madre.

There now appeared to be some prospect of the establishment of a settled government. After further discussions of the Mexican question by the representatives of the United States and the South American republics at Niagara, it was decided that recognition should be accorded to the *de facto* Government of Mexico. This was effected on October 19, 1915, and was followed at intervals by recognition by the European Powers (October 21, Austria-Hungary; November 10, Germany; December 4, Great Britain, France, Italy, and Russia).

Mexico and the U.S.A. : the Crisis of 1916.—The most important problem of the ensuing period was that of the relations between Mexico and the United States. President Wilson's goodwill towards the revolution had already been severely tried by the behaviour of both parties in the civil war. In 1916 Villa set himself deliberately to provoke American intervention by the murder of American subjects, the wrecking of trains, and the destruction of property across the border.

On March 9 he conducted a daring raid on the town of Columbus in which nine civilians and eight soldiers were killed, and which forced the United States Government to take vigorous action. General Funston was put in command of the operations on the border, and General Pershing with a force of 6,000 men was sent into Chihuahua with orders to capture Villa.

A rupture between Mexico and the United States now seemed inevitable, for anti-American feeling was so strong in Mexico that any yielding on the part of Carranza would have endangered his own position, and he was forced to send a strongly worded protest demanding the withdrawal of United States troops.

On June 16 General Pershing, who had established his

headquarters at Casas Grandes and Namequipa, received a warning from General Treviño, the commander of the Government troops, informing him that he would attack any American troops which moved either south, east or west. On June 21 a collision occurred at Carrizal between Carranzist troops and a force of American negro cavalry. The latter met with a severe reverse, and seventeen of the survivors were sent as prisoners to the penitentiary at Chihuahua.

President Wilson had already mobilized the National Militia for service on the frontier. He now sent an ultimatum to the Mexican Government, demanding the disavowal of Treviño's order, for which Carranza had accepted responsibility, and the release of the captured troopers.

Mexican chauvinism had been appeased by the Carrizal episode, and Carranza now adopted a much more conciliatory tone. The American prisoners were released, and a series of conversations took place between the Mexican envoy and the State Department at Washington. Meanwhile Pershing's force was withdrawn across the border.

Thus ended the crisis. Villa remained at large and has continued to cause disturbances in Chihuahua. On at least one occasion (at Isleta Ferry, June 1917) there has been further fighting on the border between Mexicans and American troops.

The joint commission which met in the latter part of 1916 to discuss the settlement of American claims in Mexico is said to have reached an agreement, which, however, was not ratified by the Mexican Government.

The European War, apart from its effects upon economic conditions, introduced the complication consequent upon a large irruption of Germans into the country, as mentioned elsewhere, and the attitude of the Government towards Germany caused considerable anxiety in the United States (see p. 58). It appeared, however, that a measure of civilian opinion in Mexico favoured a *rapprochement* with the United States, even though military opinion was largely under German influence. A severance of diplomatic relations

between Mexico and Cuba in the early part of 1918 was regarded as a German inspired machination to foment trouble with the United States.

Internal Situation, 1916-18.—The Carranza Government has not yet succeeded in restoring order and in reviving the economic life of the whole country. A review of the position taken in the early part of 1918 indicated that such improvement as had taken place was practically confined to the southern portions of the Republic, and in particular to the Federal District. Here hostilities had almost ceased, but in the north (Chihuahua and neighbouring territories) conditions were still bad, though not so bad as wholly to suspend commercial and industrial activity. During the long period of anarchy, the administration and the public services, especially the railways, had become entirely militarized and greatly disorganized, and the practice of rewarding partisans of the revolution with posts for which they were not qualified made the problem of restoring peace conditions an extremely delicate one. Moreover the military governors have proved difficult to control, especially in the more distant provinces, where they tend to regard themselves as independent. Zapata, Villa, and other chiefs remain unsubdued. Felix Diaz was reported early in 1918 to be in Mexico, and to be gaining power with a view to an attempt against the Government. The enforcement of the laws against foreign financial interests and the Church promises to be a fruitful source of difficulties, and the extremely restricted amnesty decrees seem to be too limited to permit the return of the political refugees.

The Constitution and the Presidency.—Nevertheless constitutional government has been at least nominally restored. In November 1916 a National Convention met at Queretaro to consider the amendment of the Constitution. On January 31, 1917, the new Constitution was signed. It contains, in addition to many political changes, the agrarian, anti-clerical and social measures already described as part of the Constitutionalist programme, and referred to elsewhere in this volume.

The elections for the presidency were held in March 1917, the candidates being Generals Carranza, Obregon, and Gonzalez. Carranza was elected president, receiving 797,305 votes out of a total of about 812,000 votes cast. General Carranza took the oath as President on May 1, 1917. Soon afterwards a new ministry was formed in which Señor Perez succeeded Señor Cabrera as Minister for Foreign Affairs and Agustin Castro succeeded General Obregon as War Minister.

CHAPTER V

RESOURCES, TRADE, AND FINANCE

Agriculture (Food products, &c.—Industrial crops)—Domestic animals—Fishing, &c.—Mining, &c.—Oil-fields—Manufactures—Water power—Industrial concessions and the Constitution of 1917.

Imports and exports—Shipping—Labour—Wages.

Finance (Revenue and expenditure—Loans and national debt)—Currency—Banks—Weights and measures.

AGRICULTURE

Food Products, &c.

THE areas suitable for particular crops, or for agriculture generally, are more or less strictly localized. This is especially the case in the northern frontier States and Lower California, San Luis Potosi, and Zacatecas, with their extensive desert or semi-desert areas; probably in none of these States is as much as three per cent. of the total area available for cultivation. South of 22° N., some two-thirds of the total area are mountainous and unfit for cultivation; and for the whole of Mexico it has been calculated that not more than 37,500 square miles, or about 5 per cent. of the whole country, are available for the cultivation of food products. Again, the primitive methods of extensive agriculture in common use have in many parts exhausted the soil; thus in some of the most fertile lands of Guanajuato it was recently estimated that the yield of maize did not exceed 9 to 11 bushels per acre. Under the régime of Diaz, from 1908 onward, much attention was paid to the extension of irrigation, which is very necessary to the agricultural development of the country, and under that régime about £9,000,000 was authorized to be appropriated for irrigation works, but the revolution arrested schemes in prospect.

Supplies, under existing conditions, are unreliable. Even

in years when the yield of maize and wheat has been greatest it has not sufficed, whether on account of deficiency in the total home production, or of the greater ease of importing where local transport is imperfect. The latter condition has certainly applied of recent years, for an official report in 1916 indicated that while producing centres might be over-supplied with their own products, other places were wholly lacking, and on this account the recent disorganization of most of the railway services has been a principal cause in bringing much of the country near to a state of famine.

At all times the stoppage of external supplies of cereals would be dangerous to the country. On the other hand, under normal conditions considerable quantities of some food products are exported, such as beans and peas, barley, and root crops, and some maize was sent to Guatemala and Salvador. The stoppage of meat and other imports of animal products would affect the country less than that of cereals, for these do not normally stand in so large a proportion to the production of the country. But that production itself, as will be shown, is not great, and the same condition of uncertainty would apply to these as to vegetable products.

Maize.—This grain furnishes one of the chief articles of food of the people of Mexico—the *tortilla*, universally eaten in all the States. Maize is chiefly grown in the region south of latitude 21° N. According to official figures for 1907, the greater proportion is grown in the State of Jalisco, where in the canton of La Barca, to the north-east of Lake Chapala, about one-fourth of the total maize production in that year was grown. The two other most important maize districts in the same State are Ameca and Ahualulco, west of Guadalajara. The next largest maize-producing State was Yucatan, but here practically the whole output came from the district of Izamal in the centre of the State.

The third productive area is the State of Mexico, where three-fourths of the output comes from the district of El Oro de Hidalgo and the Toluca valley. The whole of Guanajuato

is a maize area, while in Chiapas three-fourths of the output comes from the two districts of Pichucalco and Simojovel, adjacent regions on the eastern slope of the eastern sierras. In Guerrero three-fourths of the maize comes from the two districts of Morelos and Tabares.

The other principal maize-producing States are Michoacan, Vera Cruz, Puebla, Hidalgo, Oaxaca, and Colima. In these regions the productive areas are fairly evenly distributed, but although maize is grown in all the other States, and even to a small extent in Lower California, there are large areas within those States which are unproductive, or where the output is exceedingly small.

The production of maize and wheat is not as a rule sufficient for the local demand. In certain years considerable quantities of both cereals have been imported to supply the deficiency, and the Government is invested with discretionary power to remove the import duties when necessary. In the year 1911-12, 38,700 tons were imported. The production varies from year to year, but the average production under normal conditions appears to have been about 5,400,000 tons. Recently, however, this production must have decreased considerably.

In average years the value of the Mexican maize crops exceeds that of any other agricultural product, and in many sections of the country two crops are produced. Little care is taken with regard to the rotation of crops, and the same land is used again and again for the same product. The extension of irrigation and improved methods of cultivation would stimulate the production of maize, as both climate and soil are suitable in many parts of the country.

Wheat.—The production of wheat is much less than that of maize and generally proves insufficient for the needs of the country. The chief productive areas are in the States of Michoacan, Guanajuato, Chihuahua, Sonora, Puebla, Coahuila, Queretaro, Tlaxcala, and Durango, i.e. on the high plateau or mountainous districts north of lat. 18° N. Small quantities are grown in the other States, with the exception of Tabasco,

Campeche and Yucatan ; Nayarit, Sinaloa, Guerrero, Colima, and Tamaulipas ; and the territory of Quintana Roo, which produce none or practically none.

The principal producing areas in 1907 were in the district of Zinapécuaro around Lake Patzcuaro, 6,717 ft. above sea-level, where about one-quarter of the Mexican wheat is grown, and in the district of Puruandiro to the north of the former area. From these two zones come five-sixths of the wheat grown in Michoacan. In Guanajuato, the second wheat-producing State, the chief output is from the south of the State around Lake Gurirapundaro and in the adjacent districts of Penjamo, Celaya, and Cortazar. In Chihuahua practically the whole production comes from the five districts of Jimenez, in the valley of the Rio Grande, Galeana, Hidalgo, Iturbide, and Camargo. In Sonora the chief wheat areas are in the valleys of the Sonora and Altar (Ascencion) rivers in the adjacent districts of Altar, Arizpe, and Magdalena, and in the valley of the Rio Matape around Alamos. These four districts produce about five-sixths of the output of the State.

In Puebla fully half of the output comes from the district around Huejotzingo and a quarter from the valley of, and adjacent to, Atlixco, also a noted sugar area, south of the former district. In Coahuila half the production comes from the district around Monclova and the larger portion of the rest from the neighbourhood of Viesca, where there are an abundant rainfall and two lakes. In Queretaro nearly the whole output comes from the valley of the Queretaro and around the city of that name, while in Tlaxcala the principal producing districts are Juarez and Hidalgo.

The crop is subject to great vicissitudes, chiefly owing to uncertain rainfall and lack of irrigation works. The average production appears to be about 285,400 tons. In years of scarcity it is always necessary to import large quantities from the United States or Argentina. Thus in 1912 about 30,000,000 bushels ¹ (some 410,400 tons) are said to have been imported, but the total figures for the importation of all

Mexican Year Book,

grains, with the exception of maize, for the fiscal year 1911-12 are given as 56,417 tons only.

The average yield of wheat per acre is about 20 bushels. The Mexican plan of cultivation renders it possible to take off the land three crops during the year—one of wheat and two of maize (see p. 101). The area best adapted for wheat is on the great plateau at an elevation of 6,000 to 9,000 ft., and is stated to comprise some 52,000 square miles, of which one-third could be planted with wheat without detriment to other existing crops. If this area were fully cultivated it is estimated that the production of wheat would be over 111,000,000 bushels, which would not only supply the local demand but leave a very large surplus for export to Europe. Mexican wheat is small and hard, and when properly milled makes good flour. The consumption per head of the population, taking the figures for 1912 as a basis, is small; the great majority of the people subsisting on maize, the failure of which crop becomes a national calamity.

Barley.—The production of barley in 1907 was estimated at 1,220,000 tons. The productive zone is enclosed within a triangular area whose apex is in the northern portion of the State of Coahuila and whose base is upon the parallel of 17° 22' N. from the Gulf coast to the Pacific. Within this area practically all the barley grown in Mexico is produced. The chief barley-producing State is Oaxaca, where more than one-third of the output of Mexico is grown in the district of Nochixtlan, on the watershed of the river Salado and the western head-waters of the Rio Verde. The State of Mexico, especially in the district of which El Oro de Hidalgo is the centre, produces about a fifth of the output; the greater portion of the rest coming from the States of Puebla, Hidalgo, and Tlaxcala, and the district of Minatitlan in Verà Cruz.

Oats and Rye.—A small quantity of oats is grown in the States of Mexico, Lower California, Nuevo Leon, Michoacan, Coahuila, Jalisco, and Oaxaca, but not elsewhere in the Republic. The output for 1907 was estimated at 400 tons, of which seven-twentieths came from the district of Texcoco

in Mexico and the greater part of the rest from the northern districts of Lower California. Rye is grown in the three States of Tlaxcala, Puebla, and Vera Cruz, but chiefly around Juarez, in the first State, and Techamachalco in the second. The total output for 1907 was 1,637 tons.

Rice.—Rice is grown in all the coastal States with the exception of Sonora, Sinaloa, the territory of Lower California, where the rainfall is either too small or too uncertain for this crop, and Yucatan and Quintana Roo. It is also grown in some of the interior States, especially Morelos.

Broadly speaking, the rice area lies between parallels of lat. 21° N. and 17° N. (beyond which zone cultivation is spasmodic and apparently unsatisfactory), and below the high plateau of the interior. From this region comes at least nine-tenths of the rice grown in Mexico. The production as a rule is not sufficient for the needs of the country and in 1911-12 1,280 tons were imported. The average production for the years 1899-1908 was 24,750 tons.

In Michoacan, the largest producing State, the principal rice areas are the district of Apatzingan, between the Tepalcatepec and its northern tributary, where is grown two-thirds of the rice coming from this State, and the district of Uruapan to the north of the former area. In Morelos the districts of Juarez and Tetecala are the chief rice areas. In Puebla the district of Chiautla, in the valley between the rivers Poblano and Coetzala, and the region around Matamoros, also a sugar district, are the chief productive areas. In Vera Cruz practically the whole output comes from around Cordoba and Vera Cruz, and in Chiapas the district of Pichucalco, close to the southern borders of Tabasco, produces nearly all of the rice grown in that State. In Colima, the central district, and in Nayarit the region around Tepic, are the chief rice areas. In Jalisco the Ciudad Guzman district, and in Tabasco the districts of Jalapa, Teapa, and Huimanguillo, all adjacent to the most productive area (Pichucalco) in Chiapas, are the principal localities in which rice is cultivated.

Beans.—Various kinds of bean afford staple articles of

food, among which the *frijol*, or Mexican bean, a haricot of high nutritious value, is used at almost every meal of the common people. The *frijol* comes from a leguminous plant (*Phaseolus vulgaris*) and is grown in every State, but chiefly in Guanajuato, Chiapas, Jalisco, and Vera Cruz. The total production estimated in 1907 was 2,113,472 hectolitres. The chief productive areas in Guanajuato are Allende and Yuriria; in Chiapas around Pichucalco and Zintalapa; in Jalisco the district of Lagos; in Vera Cruz around Papantla and Tuxpan; in Chihuahua around Iturbide; and in Puebla at Zaragoza and Tepeaca. In normal years there is a considerable export of this product, amounting to 6,372 tons in the year 1911-12.

In addition to the *frijol*, the *garbanza* or chick-pea is an important article of diet, especially among the upper classes. The production in 1907 was estimated at 543,792 hectolitres, but after that date it probably increased largely, as in 1911-12, 27,414 tons are stated to have been exported. The chief producing areas are in the district of La Barca, in the State of Jalisco, and in the States of Michoacan, Guanajuato, Sonora, and Sinaloa. In Sonora the entire output comes from the district of Alamos, which is also a wheat-growing area.

Broad beans, known as *haba*, are also a considerable item of consumption. The production in 1907 was estimated at 342,988 hectolitres, of which more than one-third came from the district of Morelia in Michoacan.

Potatoes.—The potato is not generally eaten alone, but in soups and other dishes. In 1907 the production was stated to be 16,700 tons, of which about one-third was grown in the State of Chihuahua. The chief productive area is the district of Guerrero. This district is situated on the western side of the eastern sierras. The next most productive States are Tlaxcala, in which the output comes from the two districts of Juarez and Morelos; Puebla, in which almost the whole production comes from the districts of Altatriste and Tlatlanquitepec; Vera Cruz, Jalisco, Guanajuato, and Mexico. Potatoes do not appear to be imported.

Sweet Potatoes.—The sweet potato is grown in all the States excepting Tamaulipas, Tlaxcala, the Federal District, and the territory of Quintana Roo. In 1907 the output was estimated at 26,857 tons, and the chief productive areas were the States of Michoacan, Guanajuato, Jalisco, Oaxaca, and San Luis Potosi. In the first State the district of La Piedad, a large agricultural region on both sides of the Rio Lerma, highly cultivated and producing considerable quantities of sugar-cane, maize, wheat, and fruit, grows about one-fifth of the output of the country; but the adjacent district of Zamora, to the south-east of Lake Chapala, and the district of Zinapécuaro, to the east of Lake Cuitzeo, are also centres for the production of the sweet potato. In Guanajuato the Valle de Santiago, in Jalisco the districts of La Barca and Ciudad Guzman, in Oaxaca the neighbourhood of Ocotlan, about forty miles south of the capital, in San Luis Potosi the district around Santa Maria del Rio near the head of the river of that name, are other important producing areas.

Other Vegetables are not cultivated to any large extent. The *calabaza* or pumpkin is grown in Sinaloa, where about half of the output is produced, Vera Cruz, Nayarit, Michoacan, and the Federal District. A kind of pumpkin called *chilacayotte* is grown almost exclusively in Chiapas. Tomatoes of various kinds, such as the *jitomate*, chiefly grown in Jalisco, the Federal District, and Morelos, and the tomato proper, are extensively used with red pepper to make Chili sauce and also eaten in soups and other dishes. Onions and garlic are grown in every State. Cabbages are chiefly cultivated in Vera Cruz, Chiapas, and the Federal District; lettuces mainly come from the last territory; the *chayotte* or Mexican star-cucumber is principally cultivated in Vera Cruz; radishes, turnips, and carrots are grown practically in every State.

In addition to the above small quantities of beet (*betabel*), celery (*ajo*), cauliflowers, turnip-cabbages (*colinabo*), spinach-beet (*acelga*), peas, kidney beans, parsley (*perejil*), and mint (*yerbabuena*), are grown. The egg-plant (*berengena*) is cultivated in Yucatan, Vera Cruz, Tamaulipas, and Tabasco.

Fruits.—Before the revolution the fruit industry had made considerable progress and many large fruit estates had been established in various parts of the country, particularly in the regions within easy reach of the chief centres of population or near to the United States. This was specially the case in the State of Sonora, where large orange groves had been established in the neighbourhood of Hermosillo and near Guaymas.

Most of the tropical and subtropical fruits are cultivated in Mexico. Oranges, lemons, limes, grape-fruit, bananas, mangos, zapotes, mameys, aguacates, granadillas, chirimoyas, granadas, guavas, papayas, and pineapples are for the most part indigenous. Of these, bananas are extensively cultivated in Tabasco, and in Vera Cruz especially in the country tributary to Tampico, but mainly as a subsidiary crop and for local consumption. Oranges are grown for the American market, although there is also a large local consumption, and they are most successfully cultivated in Vera Cruz, Jalisco, Nayarit, Yucatan, San Luis Potosi, Puebla, Michoacan, Guerrero, and Durango, in the order named, as well as on irrigated land in Sonora. Pineapples are extensively grown in most parts of Mexico, but especially in Nayarit, which produces more than one-third of the output; Hidalgo, where nearly another third is grown; Puebla; and Tabasco. The papaya, valuable not only for its fruit but for the papein extracted from it, is popular in all regions where there is rich well-drained soil. About half of the output comes from Vera Cruz, but the States of Jalisco and Puebla also produce considerable quantities. Melons are plentiful, the water-melon, termed *sandia*, is grown chiefly in Sonora and Sinaloa, but also in large quantities in Yucatan, Michoacan, Jalisco, and Chihuahua and Coahuila, as well as practically everywhere in the Republic. The other variety grows best in Sinaloa and Michoacan. The avocado pear or *aguacate* is another favourite fruit of which large quantities grow in Vera Cruz, Yucatan, and Michoacan. There are many varieties, but it is as yet almost uncultivated in Mexico. Dates are grown mainly in Lower California,

but also to a small extent in Nuevo Leon, Puebla, Sinaloa, Sonora, and Oaxaca. Figs also chiefly come from Lower California, but considerable quantities are produced in Coahuila, San Luis Potosi, Chihuahua, Durango, and Michoacan. The Barbary or Indian fig, or *tuna*, the fruit of the prickly pear, is mainly gathered in San Luis Potosi, where at least half of the output is grown, but also in Michoacan, Zacatecas, Jalisco, Puebla, the Federal District, Aguascalientes, Mexico, and other states. The mango is grown chiefly in Vera Cruz and Jalisco ; and the custard apple mainly comes from Michoacan, Morelos, and Vera Cruz. A fruit called *capulin*, something like a cherry, is produced in enormous quantities and largely eaten.

Mexico is largely dependent upon American, chiefly Californian, supplies of orchard fruits. Strawberries are grown around Iraputo, in Guanajuato, in Chihuahua, and in Sinaloa ; while raspberries are grown at San Angel, near the capital. Apricots are grown in Puebla, Sonora, and Coahuila ; cherries almost exclusively come from Michoacan ; plums are cultivated in nearly every State, but chiefly in Jalisco, Vera Cruz, Yucatan, and Nayarit ; and small quantities of gooseberries are grown in Tabasco and Chiapas. Apples are extensively cultivated in the State of Jalisco, which produces at least nine-tenths of the output ; and pears mainly in the same State, but also in Chihuahua and Michoacan.

Comparatively little progress has been made with grape-culture, although grapes are grown in practically every State. The industry, however, is well established in the vicinity of Parras, State of Coahuila, and wines are manufactured there and elsewhere.

Other characteristic fruits are the various kinds of *zapotes*, not included in the general term, such as the *zapote amarillo*, *zapote blanco*, and *zapote prieto* ; the *arrayan*, or *Myrtus aravan* ; the tamarind, which mainly comes from Guerrero, Zacatecas, Michoacan, and Jalisco ; the *caimito*, or star-apple ; the *toronja*, or shaddock ; and the *mora*, or milberry. The *chatacano* is a kind of apricot and is principally grown in

Michoacan, Chihuahua, and Puebla; and the *huamachil* (*Pithecolobium dulce*) is mainly the product of Michoacan, Jalisco, Guerrero, and Nayarit.

The importations of fresh fruits and vegetables in the year 1911-12 amounted to 6,951,882 kg., and of dried and preserved fruits to 2,803,506 kg. In addition 1,077,885 kg. of jams of various kinds were imported during that year. There was an export of fresh fruits amounting to 17,912,569 kg., and of dried fruits amounting to 1,282,867 kg., so that the balance was in favour of Mexico.

Vegetable Oils and Condiments.—Among the many plants producing oils, both for human consumption and industrial purposes, the *ajonjolí* (*Sesamum indicum*) is cultivated almost exclusively in the States of Michoacan and Guerrero. In the former practically the whole output comes from the neighbourhood of Huetamo in the valley of the Rio de las Balsas, and in the latter the greater portion is grown in the district of Mina. Coco-nut oil mainly comes from Nayarit, but also from Guerrero, Jalisco, and Colima. Castor oil comes almost exclusively from the State of Oaxaca, but a small quantity is also produced in Jalisco. Linza oil is also produced in the latter State, and cotton-seed oil in Guerrero, Oaxaca, and San Luis Potosi. Oil is also extracted from the pea-nut, and from the olive, which is grown for this purpose in Lower California, Guerrero, and the Federal District. An oil-yielding fruit to which special attention has recently been directed is the *chichopoxtle*, which occurs in the district of Torreon.

Among plants used in cookery, in addition to sesamum, the pistachio or *cachuate*, and chillies, are cultivated in nearly all the States. Pepper is mainly grown in Vera Cruz and vanilla in the same State and, to a small extent, in Puebla and Oaxaca. The vanilla of Vera Cruz chiefly comes from the neighbourhood of Papantla and is stated to be superior to all other varieties as to its aroma. In the American market it fetches two or three times the price paid for the product from other countries.

Plants used in Distillation.—Various plants yield a number

of different alcoholic drinks, of which *pulque*, produced from 33 kinds of *maguey* (*agave*), is the beverage of the common people. *Pulque* is not of high alcoholic power but drunk in excess, as it often is, it produces serious results. Around Apam, in the south of Hidalgo, the plains are as celebrated for the production of *pulque* as are the Valle Nacional for tobacco and Yucatan for henequen. This region is continued into the State of Tlaxcala, where the two districts of Morelos and Ocampo are each almost as productive as the Apam area. In the State of Mexico the great *pulque* district is Otumba, but the districts of Tlalnepantla, Texcoco, and Toluca, as well as the Federal District itself, are also large producers. The principal *pulque* region, therefore, is comprised within a circle of which the centre is the city of Mexico and the circumference is at Toluca, Apam, and the eastern side of Tlaxcala respectively. Within this region, with the exception of the State of Morelos, is produced practically nine-tenths of the output of the country.

In addition to *pulque* a number of other drinks are manufactured from the agave. Of these, *mezcal* is largely consumed by the lower classes and is made in practically every State, but more especially in Jalisco, which produces nearly one-half of the total, Nayarit, Sinaloa, Sonora, and Guanajuato. This liquor and *tequila*, which is distilled from a species of *maguey* called *zotol*, growing extensively in Jalisco and especially around Tequila, are exceedingly potent drinks.

The various forms of spirits known as *aguardiente de caña*, manufactured from sugar-cane; *aguardiente de maíz*, *aguardiente de pulque*, and *aguardiente de uva*, manufactured from grapes; which resemble *tequila*, are made in large quantities. The first comes chiefly from the States of Vera Cruz, Morelos, Chiapas, Guerrero, Jalisco, Michoacan, Oaxaca, and Tlaxcala, in the order named; the second almost exclusively from the district of Celaya in Guanajuato; the third almost entirely from the two districts of Ciudad Guzman and Guadalajara in Jalisco; and the fourth from the two States of Coahuila

and Durango. In the last State, Mapimi is the only productive region.

Large quantities of spirits and wines are imported into Mexico. In the year 1911-12, the importations of *aguardiente* reached a total of 355,000 gallons, of liquors 63,000 gallons, and of wines 2,100,000 gallons.

Medicinal Plants.—In addition to the fruits there are many species of medicinal plants cultivated or gathered in Mexico. In an official list prepared in 1893, 233 distinct species of this character were given. Among the most prominent is sarsaparilla (*Smilax sarsaparilla*), which grows wild, but is chiefly exported from the States of Vera Cruz, San Luis Potosi, Jalisco, and Puebla. The jalapa root (*Ipomaea* sp.) is most largely produced near the city of Jalapa and in the State of Hidalgo. Damiana (*Biglovia venenata*) and the castor-oil bean thrive throughout the country.

Honey.—Among minor products the harvest of honey reaches considerable proportions. The chief productive areas are in the States of Jalisco, Hidalgo, and Yucatan. In the first the principal district is around Colotlan. In Hidalgo practically the whole output comes from Huejutla and Zacualtipam. In Yucatan the chief area is around Acanceh, south-east of Merida.

Sugar.—The production of sugar, under normal conditions, is sufficient to supply the ordinary needs of the country and to leave a small surplus for export. Although in many districts the methods employed are primitive, in others large and well-equipped sugar factories have been erected, especially in Morelos, Sinaloa, Vera Cruz, Michoacan, and Jalisco.

Sugar-cane grows in practically every State, but especially in the Gulf States where the rainfall is sufficient and the soil fertile. In the inland State of Morelos, which is the greatest producer, irrigation is necessary, as well as on the sugar lands of the Pacific coast. The yield at elevated levels, where from 25 to 45 tons per acre are said to be the average, is less than in the lowlands and tropical districts, in which from 40 to 60 tons are the average production.

The average annual production of sugar-cane during the years 1899-1908 was 1,900,000 tons, of sugar 88,500 tons, of molasses 62,000 tons, and of *panocha* 74,200 tons. The last is an inferior brown sugar, of which the consumption is almost entirely local. The chief States for sugar in their order of production are Morelos, Vera Cruz, Sinaloa, Puebla, Michoacan, and Jalisco. From the agricultural point of view Morelos is one of the richest States of the republic. The topographical conditions of the State are varied. The hot climate of the southern and central regions is admirably suited for the cultivation of sugar, whilst the abundant rains on the slopes of the northern mountains provide the water necessary for the irrigation of the plantations. Morelos produces about one-quarter of the sugar and one-third of the molasses manufactured in Mexico. The largest productive region in the State is the district of Morelos, but the districts of Juarez and Tetecala are also large producers.

In Vera Cruz the chief productive areas are around Orizaba, which is also one of the most important for coffee ; and in the districts of Cosamaloapan and Cordoba, especially the latter, which is also a district where pineapples, bananas, coffee, and tobacco are grown on the numerous *haciendas*. In Sinaloa two-thirds of the output comes from the district of El Fuerte in the valley of the Rio del Fuerte, while the rest comes from the district of Culiacan Rosales close to the coast in the valley of the Rio de Culiacan. In Puebla practically the whole output comes from the districts of Matamoros and Chalchicomula, and in Michoacan nearly half from the district of Tacambaro. In Jalisco the two districts of Ciudad Guzman and Sayula produce nearly all the sugar grown in the State.

It was estimated in 1911 that there were over 2,000 sugar mills in Mexico and that not more than 10 per cent. of the land available for this product had been utilized. In the State of Vera Cruz there are 164 large sugar plantations. The largest sugar factory in the republic, known as San Cristobal, situated on the banks of the Rio Papaloapam, a stream which empties into the Gulf of Alvarado, is in this

State. Here it is possible for steamers drawing 12 feet to load at the wharves. The mill on the Columbia plantation of the Mexican Tropical Planters' Company, in the State of Vera Cruz, has been reconstructed and includes filters and bagasse carriers. At Omealca, in the same State, there is a large mill with a capacity of 250 tons daily, and the Sinaloa Sugar Company and the Aguila Refinery Company possess modern plant capable of giving a yearly return of 2,000 tons each. The Oaxaqueña plantation, near Santa Lucretia, Oaxaca, has a mill capacity of 1,000 tons daily, with an elevator of 25,000 tons capacity.

In addition to sugar-cane, sugar-beet can be grown in most parts of the republic. As there is a tendency to convert sugar-cane into alcohol, it is possible that the growing of beet may become important. Hitherto the greater part of the beet has been used as food for cattle.

The export of sugar in 1911-12 was 23,703 tons and the import 1,002 tons, chiefly of the better varieties.

Cocoa is grown chiefly in the States of Tabasco, Chiapas, and Vera Cruz. The plant, although indigenous, grows comparatively slowly in Mexico and takes ten years to reach maturity, though it yields before that period. The average annual production during 1899-1908 was 2,316 tons. Tabasco produces three-quarters of the output, of which the greater portion is grown in the districts of Teapa, Conduacan, Macuspana, Tacotalpa, and Comalcalco. In Chiapas, which produces nearly one-quarter of the total, practically the whole output comes from the district of Pichucalco, situated in the foothills of the Sierra Madre between the Rio Grijalva and Rio Blanquilla. In Vera Cruz the districts of Minatitlan, Misantla, and Huatusco are the chief producers. With the exception of small quantities grown in the Pacific States of Jalisco, Michoacan, Guerrero, and Oaxaca, and Nayarit, the whole output comes from the above-named States, the cocoa area being confined mainly to the Gulf slope between parallels 20° and 17° N. The plant thrives best at an altitude not higher than 2,000 ft.

Coffee.—In Mexico this plant seldom thrives below an altitude of 1,500 ft., and above 5,000 ft. Artificial shelter is always necessary. The chief producing area is about the Isthmus of Tehuantepec, including parts of States of Vera Cruz, Chiapas, and Oaxaca. These plantations, belonging in 1907 to the Continental Commercial Company, of St. Louis, U.S.A., contained about 1,000,000 coffee trees. The well-known Hacienda del Corte, about 18 miles from Palomares on the National Tehuantepec Railway, and the estates of La Junta, Gascajal, and La Solidaridad in the State of Vera Cruz are also large coffee areas; while coffee, claimed to be of a specially delicate flavour, is grown in Colima and the Uruapan district of Michoacan. The other principal producing States are Puebla, San Luis Potosi, and Michoacan. In Vera Cruz the principal areas are in the districts of Zongolica, Chicontepec, and Cordoba. The first and third of these regions lie in the highlands south-west of Vera Cruz. The second lies due west of Tuxpan on the borders of Hidalgo. In the Cordoba region the coffee zone centres around Sumidero and extends from Paso del Macho to Orizaba over an area about 35 miles long by 20 miles wide. The other productive areas are the adjacent districts of Huatusco and Coatepec and the more northerly districts of Jalacingo and Misantla. In Chiapas almost the entire output comes from the districts of Tonala on the western slopes of the Sierra Madre, and Simajovel in the northern foothills of the sierras. In the former district is grown about five-sixths of the coffee produced in the State. In Oaxaca the chief productive area is Pochutla in the extreme south, and in Puebla the district of Zacapoaxtla, in the valley of the Rio Apulco, is the principal coffee region. In San Luis Potosi almost the entire output comes from the district of Tancanhuitz, situated in the highlands between the Rio Panuco and Rio Maria, and in Michoacan the principal coffee districts are Uruapan and Chalcoman.

The average production of coffee for the years 1899–1908 was 34,244 tons. Of the production in 1911–12, 24,000 tons were exported, about two-thirds going to the United States.

Industrial Crops

Fibre Plants.—Mexico is rich in fibre plants. Among the cacti are many of economic value. They form the dominant vegetation of vast plains on the central plateau, of Lower California, of the northern coastal regions on both sides of the sierras, and of portions of the low-lying tropical regions of the south.

Chief among fibre plants is henequen (*Agave sisalense*) or sisal hemp, indigenous to the peninsula of Yucatan. It derived the name sisal, by which it is generally known elsewhere, from the fact that it was first exported through the port of Sisal. Three principal varieties, which grow wild, are known to the Yucatecos as *chelem*, *cahum*, and *citamci*. The two varieties of the cultivated plant are the *yaxci*, or green fibre, and the *sacci*, or white fibre, the latter being derived from the wild *chelem* while the former was cultivated prior to the conquest of Mexico.

The average productive life of the henequen plant is ten years. The leaves are collected and the fibre extracted in a decorticator; bleached, dried, pressed into bales, and prepared for shipment. In Yucatan the henequen industry has assumed large proportions. There are at least 400 large plantations in the peninsula and the output of henequen represents one of the chief values in the list of Mexican agricultural products. The yield is influenced by weather conditions, humidity retarding growth, and there is no fixed harvesting season. The size of the average plantation is 500 acres, and in 1907 it was estimated that about 100,000 acres were under cultivation, giving employment to some 90,000 Indians. Henequen is cultivated also in the neighbouring State of Campeche, in Jalisco, in the territory of Quintana Roo, in Oaxaca, and recently, it is stated, near Victoria, in Tamaulipas, and on some of the semi-arid lands of Nuevo Leon. Henequen is cultivated in every district of Yucatan, but chiefly around Motul, Acanceh, Hunucma, and Merida. Practically the entire output is exported through

Progreso. The production has varied from year to year; during 1899-1908 it averaged 93,736 tons yearly.

In 1915 contracts were entered into between a Government Commission for the Regulation of the Henequen Industry and the producers of hemp in Yucatan and Campeche on a so-called profit-sharing basis. During a period of five years all henequen grown was to be delivered to the Commission, which fixed prices to both producers and buyers, and retained a large share of the profits; controlling the railway service, it provided no cars except to its own consumers. A State duty and a federal duty were imposed on the exports, and railway freights and warehouse charges at Progreso were increased by 300 per cent. The industry became practically a Government monopoly.

Another important fibre plant is *ixtle*, imported into the United States as *ixtle* or Tampico fibre, extracted from the leaves of the *lechugilla*, an agave. The plant grows in a dry climate and thrives in the sandiest and most barren sections of the northern part of the republic. Five-sixths of the output comes from the plains of Coahuila, principally from the district around Monclova. In the adjacent State of Nuevo Leon the principal areas, Doctor Arroyo, Aramberri, Rayones, and Galeana, are in the south of the State, and at Santa Caterina near to Monterey. In San Luis Potosi the two chief zones are around Catorce and Guadalcázar, and in Tamaulipas practically the whole output comes from the Cuarto district and, like most of the *ixtle* fibre, is exported from Tampico.

Of the other fibre plants *zapupe*, growing more particularly near Tuxpan and elsewhere in the State of Vera Cruz, and in Tamaulipas, has only recently emerged from the experimental stage. Seven kinds are known, but only three have been cultivated—the *estope* or hue, the *tantoyuca*, or long leaf, and the *tepezintla*, or short leaf. The last is claimed to be the most productive. From the fibre is manufactured fine cord and rope as well as a substitute for silk. *Escoba* (*Centaurea salmantica*), an indigenous fibre plant, grows in Colima;

pita (*Furcraea gigantea*) grows wild in the northern section of Vera Cruz, and is used for local consumption; and *zacaton*, or broom corn (*Epicampeus macroura*), growing in many sections of the country, is cultivated and exported under the name of *raiz de zacaton*.

Cotton is grown on the seaward slope of both sierras and also in the interior. The principal cotton region is throughout the area extending from Lakes Parras and Viesca, in Coahuila, to Mapimi in Durango, and southward to San Juan del Rio. By means of irrigation works, fed from the Rio Nazas, an industry has been built up in this area, which produces two-thirds of the cotton output of Mexico. This zone is an alluvial plain, broken by mountains rising abruptly from the level, and extends about 75 miles north and south and 100 miles east and west. The district is known, from the lakes, as Laguna, and the product as Laguna cotton. Torreon is the distributing centre.

Elsewhere cultivation is rather in isolated areas along the Pacific coast, extending from the neighbourhood of Hermosillo, in Sonora, as far as and including Nayarit, and contracting in width as the sierras approach the coast. Here in the valleys of the Yaqui and Mayo, the Fuerte, and the Santiago rivers are the principal cotton plantations of this zone. The region is extended in smaller patches along the littoral of Colima and Michoacan, and also throughout the coastal regions of Guerrero, Oaxaca, and Chiapas, from the neighbourhood of Point Japutica to the vicinity of Salina Cruz. On the eastern coast the cotton area extends from the neighbourhood of Papantla to Acayucan, in the State of Vera Cruz. The largest output comes from one region in the States of Coahuila and Durango. In the former the districts of Parras and Viesca produce practically the whole output. Cotton is also grown in the north of Tamaulipas in the valley of the Rio Grande. In Durango, ten-elevenths of the cotton comes from the Mapimi district, but the cotton area extends through the district of Nazas in a broadening belt, of which the western and eastern extremities are San Juan del Rio and

San Juan de Guadalupe. In Guerrero practically all the cotton comes from the districts of Abasolo, Allende, and Galeana; and in Nayarit the chief productive area is the coastal district of Ixcuintla, but the adjacent district of San Blas and the country around Acaponeta are also cotton zones. In Vera Cruz the principal productive districts are Vera Cruz, Cosamaloapan, and Papantla, which grow nearly all the cotton produced in the State; and in Oaxaca the contiguous districts of Jamiltepec and Juquila, in the valley of the Rio Verde, produce practically all the cotton grown in that State. The usual size of the plantations is from 2,000 to 5,000 acres.

The seed and oil are generally used locally. The oil is mostly made into soap, for which there is a large factory at Torreon. The cotton-seed cake is mostly sold in Europe. The production of raw cotton has not equalled the demands of the manufacture (for which see p. 139). The imports of raw cotton in 1911-12 were 3,752 tons.

Rubber.—Plants yielding rubber grow wild in many parts of Mexico and are cultivated on many estates, either as a shade for the cocoa plant or separately. The variety indigenous to the country is *Castilloa elastica*. In the region contiguous to the Isthmus of Tehuantepec there are large districts suitable for this tree. Vera Cruz is the chief rubber-producing State. Here in the districts of Cosamaloapan, Tuxpan, Vera Cruz, and Jalacingo, all, with the exception of the last, coastal districts, are the principal plantations. In the hot country around Monclova and Viesca, in Coahuila, a considerable amount of rubber is grown, and also in the States of Chiapas, Tabasco, and Nayarit. It was estimated in 1910 that the plantations already established amounted to about 125,000 acres. Rubber was exported in 1911-12 to the amount of 7,311 tons.

The *guayule* plant, the output of rubber from which now exceeds that of all other forest rubbers in Mexico, was not used for export purposes until 1905. It is a small shrub, growing over large areas of desert country in northern Mexico,

and has recently been exploited on a considerable scale. The localities where it is principally found are Chihuahua, the northern parts of the States of Yacatecas and San Luis Potosi, the western part of Durango, and the southern districts of Coahuila. The plant is unlikely to be of much importance outside Mexico, and it appears probable that the existing sources of supply will be exhausted in course of time unless stringent measures are taken for its protection, for it is not so abundant as was originally supposed. Guayule is found at altitudes ranging from 3,000 to 5,600 ft. The export of guayule in 1911-12 was 5,071 tons.

Several other rubber plants exist in Mexico. The *palo amarillo* tree, also known in Mexico as *palo colorado*, *papelillo*, and *cucuracho*, is a species of euphorbia. It occurs in the dry semi-tropical zone on the slopes of the Sierra Madre Occidental and extends southward from Durango to the southern part of Oaxaca and along the Pacific coast. Other rubber-yielding plants are species of *Plumeria* and *Jatropha*. Experiments have given good results from *Plumeria rubra* and from *Jatropha urens*, which yields a rubber-like material termed *mala mujer*. Another species of euphorbia, known as *Euphorbia calyculata*, is said to yield rubber of good quality; but these plants have not been exploited systematically.

Gums and Waxes.—The gum known as *chicle*, which exudes from the *Achras sapota*, or *zapote-chico*, forms a considerable item of export, and is the basis of the chewing-gum used in the United States. The principal productive regions are the districts of Tuxpan, Papantla, and Jalacingo in Vera Cruz; the territory of Quintana Roo; and the State of Campeche. In the last the whole output comes from Champoton and Carmen. *Cera de Campeche* is the recognized name of a vegetable wax much used in finishing cloth or for which a stiff or gummy finish is required. Among other gums are *goma de copal* and *goma de mezquite*. In addition a number of vegetable waxes are exported, mainly from the State of Puebla. One of these is extracted from the fruits of *Myrica jalapensis*,

known locally as *arbol de la cera*. This occurs in dense thickets covering considerable areas in Vera Cruz, from Jalapa in the south to Tulancingo and Huasteca in the north. Another wax, known as *candelilla* wax, occurs as an excretion on *Euphorbia antisiphilitica*, a plant found in great quantities in northern Mexico.

Tobacco, which is indigenous, is cultivated in all the States of Mexico with the exception of Chihuahua, Morelos, Tlaxcala, the Federal District, and the territories of Lower California and Quintana Roo. An inferior tobacco is commonly preferred in the country, but of recent years much of the tobacco has been improved and the finest Mexican leaf has been sent to Havana whence it has been exported as Cuban cigars. The best quality of tobacco leaf is said to come from San Andres Tuxtla in Vera Cruz and from the Valle Nacional.

The chief producing States in order are Vera Cruz, Nayarit, Jalisco, Oaxaca, Michoacan, Chiapas, Puebla, Sinaloa, and Tabasco. From the first comes fully half of the total output, which is mainly grown in the districts of Cordoba and Orizaba, Papantla, Tantoyuca, Los Tuxtlas, and Jalacingo; but especially around Cordoba in the valley of the Rio Seco. In Nayarit, Compostela and Santiago Ixcuintla are the principal tobacco areas, and in Jalisco, where tobacco is grown all over the State, the three districts of Mascota, Sayula, and La Barca. In Oaxaca nearly all the output comes from the district of Putla and from the celebrated Valle Nacional in the district of Tuxtepec. In Michoacan the districts of Jiquilpan, Salazar Arteaga, and Zamora, and in Chiapas the district of Simojovel, produce practically all the tobacco grown in those States.

The average annual production of tobacco in 1899-1908 was 11,800 tons. The greater part is made into cigarettes (see p. 140). There is normally a small export of cigars and cigarettes, about 176 tons in 1911-12, and a larger export of raw tobacco, 567 tons in 1911-12, of which the greater part went to Belgium and Germany.

DOMESTIC ANIMALS

Cattle.—Every State in Mexico contains districts suitable for cattle, and ranching is an important occupation, though the number of cattle is insufficient to supply the needs of the population. Mexican cattle, which were originally small in size, have been improved by the introduction of foreign breeds. The chief ranches are in the north and in the foothills of both coastal zones. On the Gulf slope of the eastern cordilleras there is an immense region with excellent pasturage, where the rains of summer and the heavy dews of autumn and winter are sufficient to prevent any notable deterioration of the grass lands. On the Pacific slope, where the dry season is more rigorous than on the Atlantic side, and the rainfall less evenly distributed, more care has to be taken to secure an adequate supply of water. Where rain is lacking for part of the year, as in considerable portions of Chihuahua, Nuevo Leon, Durango, and Coahuila, the grass is ordinarily sufficient for grazing, but hardly for the fattening of stock. As a result stock from these regions is frequently fattened on the *haciendas* of the central and southern portions of Mexico. There is thus a considerable movement of cattle from the northern plains to more fertile districts.

Distribution and Numbers of Live Stock.—The largest numbers of cattle are found in Jalisco, Chihuahua, Michoacan, Vera Cruz, Guanajuato, Sonora, Durango, Chiapas, Coahuila, Zacatecas, Yucatan, San Luis Potosi, Tamaulipas, Guerrero, and Nayarit, in the order named. Zacatecas is the principal sheep-rearing State, possessing about one-quarter of the total, and is followed by San Luis Potosi, Durango, Puebla, and Coahuila. In Durango is the greatest number of horses. It was estimated in 1902 that the number was as follows : cattle, 5,304,165 ; horses, 872,544 ; mules, 340,016 ; asses, 298,416 ; sheep, 3,458,124 ; goats, 4,240,916 ; pigs, 641,074. Before the recent revolution there was a continuous increase in the number of live stock, though exact figures are not available, but owing to the unsettled state of the country the

export of cattle has increased largely, as owners have been willing to dispose of their cattle to American canneries, obtaining a better price in United States currency, rather than let them fall into the hands of revolutionaries, and receive payment in worthless Mexican currency. Even so, some of the revolutionary bands have acquired revenue by these means. It is probable that the numbers of live stock generally have been greatly reduced during recent years.

Imports.—In the year 1911-12 the weight of live animals of all kinds imported, chiefly from the United States, was estimated at 3,480 tons, and in addition 542 tons of salted and fresh meat and salted and dried, and 4,638 tons of tinned and preserved meat, were imported.

Dairy Products.—Mexico is not self-supporting in animal foods generally, for in addition to the imported supplies of meat, considerable quantities of eggs, milk, butter, cheese, and lard are normally introduced into the country. The local production of milk and butter is abnormally small. Milk is produced chiefly in the Federal District, Hidalgo, Mexico, and Chiapas. Cheese is made principally in Hidalgo and the State of Mexico.

FISHING, &C.

A large variety of fish is found along the Atlantic coast and on the bank of Campeche, but little has been done to develop a fishing industry, except at Vera Cruz. Red snapper (*huanuchinango*) are taken principally on the bank and in the deeper waters, and similar fish called *pargo* and *robalo* off shore along the coast. Perch and bass are abundant in the rivers and fresh water lagoons of Tabasco and Campeche; the *Nanemys* turtle is also obtained and is much used for food in the Gulf coast region. Tampico is a noted centre for the sport of tarpon-fishing, and yellow-tails are also taken. Oyster beds are often found in the river-mouths and tidal lagoons between Tampico and Tabasco. Some sponge and other fisheries are carried on along the coast of the territory of Quintana Roo. On the Pacific coast there is practically

no fishing industry, apart from that for pearls along the coasts of Lower California, but it is stated that recently fishing rights have been conceded to Japan. The Government under Diaz devoted some attention to pisciculture, introducing carp, trout, and sea trout into some of the inland waters, and establishing hatcheries.

MINING, &c.

The mineral resources of Mexico are very large, and mines, principally for silver, have been worked from the early part of the sixteenth century by the Spaniards, and by the native peoples before that time. The most important mineral region forms, roughly speaking, a parallelogram extending from north-west in Sonora to south-east in Oaxaca, following the direction of the Sierra Madre cordillera, and having a length of about 1,600 and a breadth of 250 miles. The richest mines, and the majority of those famous in the history of the country, are found mostly on the western slopes of the cordillera, between elevations of 3,000 and 8,000 ft. The principal mining States are Chihuahua, Guanajuato, Oaxaca, Sonora, Durango, Jalisco, Michoacan, Zacatecas, Hidalgo, Queretaro, and Mexico, but outside the region thus defined there are mineral resources (whether developed or potential) in Lower California, Sinaloa, Vera Cruz, and several other States. The Yucatan Peninsula, including the State of that name, with the territory of Quintana Roo, and the States of Campeche and Tabasco, in the south-east, form the region least productive of minerals. The principal metallic minerals are silver, gold, copper, lead, iron, and zinc. Other mineral products are coal, platinum, mercury, manganese, antimony, sulphur, bismuth, tin, graphite, and salt. Precious stones include opal, garnet, tourmaline, turquoise, rubies, and onyx. The oil-fields of Vera Cruz and others of the Gulf States are dealt with in a later section (p. 132).

A very large proportion of the mining interests are American. No recent data are available for an exact statement, but out of the total capital engaged in Mexican mining it is probable

that the chief proportions according to nationality may be approximately represented thus : American, 77 per cent. ; British, 13 per cent. ; Mexican, nearly 5 per cent. ; French, $1\frac{1}{2}$ per cent.

The number of separate properties is very large, and in the following paragraphs only a few of the mining camps best known will be mentioned. In 1910 the properties on which taxes were being paid numbered 31,155, and among these the principal metals were distributed as follows :

<i>Metals.</i>	<i>No. of Properties.</i>	<i>Metals.</i>	<i>No. of Properties.</i>
Silver	5,968	Silver and mercury	7
Silver and gold	9,425	Copper	1,285
Gold	1,871	Copper and iron	212
Silver, gold, and copper	3,213	Copper and lead	28
Silver, gold, and lead	1,874	Iron	391
Silver and lead	4,251	Mercury	117
Silver and copper	1,207	Lead	123
Silver, copper, and lead	425	Antimony	112
Gold and copper	363	Zinc	91

The total figure quoted above includes other metals and precious stones, but not coal.

On an average of five years towards the close of Diaz's government, the annual production of silver was valued at £7,500,000 ; gold, £5,000,000 ; copper, £3,200,000 ; iron, £1,200,000 ; lead, £400,000 ; zinc, antimony, and tin, £300,000 ; coal, £1,200,000. The exports of the precious metals alone were valued at £14,295,836 in the fiscal year 1910-11, £13,947,346 in 1911-12, £13,500,000 in 1912-13, and £6,128,257 in nine months of 1913-14. Recent statistics are uncertain, but the value of gold production alone in 1914 was estimated to exceed $3\frac{1}{2}$ millions sterling, and in 1915, three millions. The recent values for silver are not stated, but the production in 1913, 1914, and 1915 are given as 70,703,828 grammes, 64,484,578 grammes, and 61,000,000 grammes respectively. The yield of copper is given thus in metric tons (but accounts vary) : 73,617 in 1912 ; 58,323 in 1913 ; 36,337 in 1914 ; 30,969 in 1915. Under the best conditions, Mexico has ranked first for silver and fifth for gold, among the producing countries of the world.

In recent years, however, revolutionary disturbances have caused the suspension or curtailment, temporary or permanent, of much of the mining activity of the country, as the above figures suggest.

In 1915, with few exceptions, mines were closed in Aguascalientes, Guerrero, Durango, and San Luis Potosi. In Sonora, at different times, all the copper mines had ceased work, and production was greatly curtailed, but the mines near Hermosillo and elsewhere were reopening as circumstances allowed. In Sinaloa and in Nuevo Leon (Monterey) some activity was maintained, and in Coahuila (Piedras Negras, &c.) and Guanajuato the position was improving. As an example, the American Smelting and Refining Company may be taken as representing one of the most important group of American interests in Mexico. This concern (founded by the German-American family of Guggenheim) has large smelting and refining works at Monterey, Aguascalientes, Matehuala, and Chihuahua. It also owns or controls mines in several districts, and it was reported in 1917 that all these were at work (though to a limited degree) except those adjacent to Chihuahua and Velardeña (Durango); the Chihuahua smelter had no immediate prospect of reopening. Mines were at work at Reforma, Mondova, Bonanza in the Mazapil district of Zacatecas, San Luis Potosi, Tepezala, Aguascalientes, and Angangueo (Michoacan). Both this company and others, in view of the dislocation of communications, had undertaken the working of their own freight on the railways, with their own staffs, and, in the case of the American Smelting Company at least, their own rolling stock.

The interests of British mining companies have centred principally in the following localities :

<i>State.</i>	<i>District.</i>
Sonora. . . .	Alamos (Los Mezcales), Hermosillo (Barranca).
Chihuahua . . .	Parral, Santa Eulalia (Buena Tierra).
Sinaloa	El Progreso.
Durango	Avino, Bacis, Guanacevi, Tamazula.
Zacatecas . . .	Mazapil, Mesquital del Oro.
Hidalgo	Pachuca (Santa Gertrudis).
Mexico and Michoacan . .	El Oro.
Guerrero	Taxco.

Prospecting has also been carried on, though development has not, in parts of Oaxaca and Chiapas. Operations have been most successful, from the financial standpoint, in the El Oro, Santa Gertrudis, Mazapil, and Santa Eulalia mines ; on the other hand a number of the mines have never reached the stage of earning dividends, and from 1912-13 onward revolutionary disturbances caused, in the great majority, a complete cessation of work.

It was reported in October 1917 that the Federal Government had prohibited the export of gold bars, and had decreed that exporters of ores and concentrates containing gold of a value exceeding 6 grammes per ton must reimport into Mexico a sum equivalent to the gold produced, in gold bars or coin, and that exporters of silver bars, ores, &c., exceeding 50 grammes per ton must reimport in gold 25 per cent. of the value of the silver.

Silver has been worked or reported to exist in every division of the country except the south-eastern region defined above (Tabasco, Campeche, Yucatan, and Quintana Roo). The most important States for its production are probably Chihuahua, Guanajuato, Guerrero, Hidalgo, San Luis Potosi, Sinaloa, and Zacatecas, although there has been a substantial production also in Durango, Jalisco, Mexico State, Oaxaca, Puebla, Queretaro, Sonora, and Lower California. Among the silver localities best known are those in the Pachuca district of Hidalgo, with Santa Gertrudis, Real del Monte, and others in this vicinity ; those in the neighbourhood of Guanajuato City ; Santa Eulalia, Batopilas, &c., in eastern Chihuahua ; the Parral and Andres del Rio districts in the west of the same State ; Sierra Mojada in Coahuila ; the Catorce region of San Luis Potosi ; the Zacatecas and Fresnillo camps in Zacatecas State ; Guanacevi in the north-west of Durango ; San Dimas near Durango City, and Velardeña and Mapimi in the vicinity of Torreon. In many of these localities gold, copper, &c., are also produced. Much of the silver ore contains gold, copper, or lead (see below). While *bonanzas* of very rich ore have been discovered, it may be said generally,

with regard both to silver and to the other metals, that the riches of Mexico lie rather in the vast quantities of low-grade ore.

Gold is very largely produced from silver ores, but both quartz lodes and to some extent alluvials have recently been worked. The production, under settled conditions, has steadily increased, owing to the discovery of new mines, and also, more especially, to the more extensive and better treatment of silver-gold ores. The El Oro field, worked by a British company, in the States of Mexico and Michoacan, is one of the most famous in the country. The distribution, however, is almost as wide as that of silver; its occurrence is reported in 25 out of the 30 divisions of the republic; but the principal gold-producing divisions are probably Chihuahua, Guerrero, Hidalgo, Lower California, Mexico, Michoacan, Oaxaca, Sonora, Zacatecas. Gold placers occur in Alamo and Triunfo, Lower California, in the Altar and Hermosillo districts of Sonora, in the Fuerte district of Sinaloa, in Durango, the Bravos district of Guerrero, and elsewhere, but not many are of economic value. Gold-bearing veins proper are found in Sonora, Sinaloa, Chihuahua, Oaxaca, and Lower California. The auriferous zone in the division last named may be regarded as the southern continuation of the California gold belt, while the veins of Sonora appear to be of the same type as those of Arizona. Gold-silver veins are found in Lower California, Sonora, Sinaloa, Durango, Chihuahua, Michoacan, Guerrero, Mexico State, Oaxaca, Guanajuato, Zacatecas, Queretaro, and Nayarit; gold-copper veins in Lower California and Sonora; gold-silver-copper veins in Sinaloa, and, with lead, in Zacatecas; copper-gold veins in Puebla, Vera Cruz, Chiapas, San Luis Potosi, and Guerrero.

Copper was practically undeveloped until the last decade of the nineteenth century, but under settled conditions Mexico reached for a time the position of second among copper-producing countries. The chief producing divisions are Lower California, including Carmen and San Jose Islands, Chihuahua, Coahuila, Jalisco, Michoacan, Sonora (Cananea,

Alamos, &c.), and Zacatecas, but several others are of considerable importance, such as Aguascalientes, Queretaro, Sinaloa, and Tamaulipas. The distribution in this case again is wide. Copper has been reported even in the territory of Quintana Roo. Low-grade ore exists in many localities where it has not been profitable as yet to work it. Among the principal copper undertakings are those of Cananea and Moctezuma (American), in Sonora, the Boleo Company (French) of Santa Rosalia in Lower California, and Mazapil (British) in Zacatecas. In addition, as has been seen, a number of localities important for gold and silver yield copper also.

Lead occurs in a large number of districts, being commonly associated with silver. The main output comes from the central plateau region, where the large mining camps of Sierra Mojada, Almaloya, Niaca, and Santa Eulalia are situated; Chihuahua, Coahuila, and Durango are the chief producing States. The lead ore from the north-eastern States goes principally to the smelters of Monterey.

Iron is known in numerous localities where it appears to be of potential commercial value, but in many instances it is difficult of access, or unworkable for other reasons under present conditions. The deposits of northern Coahuila are worked on a large scale to supply the foundries of Monterey. There are also foundries in Hidalgo and elsewhere (see p. 138). In Lower California, near Todos Santos and south of Ensenada, large iron-ore deposits are known, and in Sonora there are workable beds of hematite. Iron in various forms exists in Michoacan, Oaxaca, several parts of the Isthmus of Tehuantepec, Queretaro, Jalisco, Puebla, Guerrero, Hidalgo, Mexico, Vera Cruz, Colima, &c. A famous iron mountain called Cerro de Mercado, near Durango City, is 5,000 ft. long, 300–400 ft. high, and of an average width of 1,100 ft.; the ore is hematite of extraordinary purity.

Manganese, occurring in Lower California, Hidalgo, Mexico State, San Luis Potosi, and elsewhere, is not of high importance owing to difficulties of transport and the absence of local demand, but it has recently been developed in Chihuahua.

Zinc is produced chiefly in the Santa Eulalia, San Isidro, Almoloya, Parral, and Santa Barbara districts of Chihuahua and San Luis Potosi, and also in Sinaloa. Though its distribution is much less wide than that of other minerals previously mentioned, it has been worked, or is known, also in the States of Coahuila, Hidalgo, Jalisco, Nayarit, Nuevo Leon, Puebla, Sonora, Tamaulipas, and Zacatecas.

Platinum occurs rarely ; principally in Hidalgo.

Mercury, in different forms, is obtained chiefly in San Luis Potosi (Ramos and Santa Maria del Rio), Guerrero (Huitzuco), Queretaro, and Durango. It is much used in the so-called *patio* process for the treatment of silver ores.

Antimony has been exploited in San Luis Potosi, at Catorce and Charcas ; it occurs in several other States.

Tin, though worked by the ancient inhabitants of Mexico, has not been developed under modern conditions, but it is found in Aguascalientes, Durango, Guanajuato, Jalisco, and Mexico State.

Graphite is obtained from the Santa Maria mines in Sonora, which have supplied both American and some European pencil manufacturers.

Sulphur is obtained from mines near Cerritos in San Luis Potosi, but it occurs in several other states—Aguascalientes, Coahuila, Colima, Durango, Guanajuato, Guerrero, and Tamaulipas, and in Lower California.

Bismuth is found principally in Guanajuato and Zacatecas.

Salt is plentiful, being obtained both as rock salt and in coastal lagoons, &c. It is worked or known in Tamaulipas (Matamoros and Soto la Marina), Campeche and Yucatan, Lower California (Carmen Island), Chiapas (Tonala, Soconusco, Custepeques), Puebla, Sonora, San Luis Potosi, Zacatecas, Chihuahua, and Coahuila. Two British companies have attempted the development of the salt deposits in Carmen Island, and in San Luis Potosi, Zacatecas, Chihuahua, and Coahuila, and before the revolution they had some prospect of success.

Coal.—The principal producing State is Coahuila, where

mines have been developed in the Sabinas valley, at Fuente, Hondo, Piedras Negras (Ciudad Porfirio Diaz), Las Esperanzas, &c. The three principal coal-basins in this State are considered below. Development has also been attempted elsewhere, as in Durango (near the city of that name), in Jalisco, in Oaxaca (Tlaxiaco district, 100 miles north-west of Oaxaca City), Sonora (Sahuaripa), where the coal is an anthracite, and Puebla. In some instances, as in Puebla, the indifferent quality of the coal and lack of facilities for transport have led to failure. Coal has been recently reported at Honey in Hidalgo, and its development on a large scale is contemplated ; as here, and elsewhere, the coal-fields would prove of the first importance to the smelting and mining industries. Coal has also been reported to exist in Chiapas, Chihuahua, Morelos, Tlaxcala, Yucatan, Quintana Roo, &c.

The Sabinas coal-basin of Coahuila has an area of about 625 square miles, but it is much broken by faults, and workable areas rarely exceed 1,200 acres in a single body. The seams are generally thin ; at the best not more than 5 ft. in thickness. The field is a little over 70 miles south of the American frontier.

The basin of Las Esperanzas is of about the same area as that of Sabinas ; the coal is bituminous, similar in quality to that of Sabinas, but double its thickness, and equal or superior to American coal, excepting that of West Virginia. The principal workings are in the southern part of the basin, which lies nearly 100 miles south of the frontier.

The Fuente basin, close to the frontier, has an area of about 20 square miles. Analysis has shown the coal to consist of 40·2 per cent. of carbon, 39·4 per cent. of volatile matter, 1·4 per cent. of moisture, and 19 per cent. of ash. Owing to the high proportion of volatile matter the coal is especially valuable for roasting and gas manufacture, while the carbon content is sufficient for steam generation. The coke yielded from these coals is consumed locally.

These three coal-basins are served by the Mexican International Railway (National or Constitutionalist system) running southward from Piedras Negras.

It was estimated in 1911 that Mexico consumed about 4,500,000 tons of coal and 2,000,000 tons of coke annually, and that the output of the country did not reach 1,000,000 tons. Mexico has therefore been dependent on the United States largely, and on Europe to some extent, for coal. It should be added, however, that of recent years oil fuel from the wells of the Gulf States has in great part replaced coal for use on railways and for other purposes, including some of the processes in the Monterey foundries and other industrial works.

Peat has been used for various purposes, especially the production of gas. A very large deposit exists near Mexico City; a British company was concerned in attempts to develop this.

Guano concessions have been granted on certain islands in the Pacific, in Lower California, and on reefs in the Gulf of Mexico.

OIL-FIELDS

Distribution of Oil-fields.—The oil-fields of Mexico are situated in the lowland behind the Gulf coast, and extend from the southern part of the State of Tamaulipas in the north through Vera Cruz and the eastern part of San Luis Potosi to the State of Tabasco in the south.

(1) The most important oil area extends from Rio Soto la Marina in Tamaulipas across the rivers Tamesi and Panuco into northern Vera Cruz¹, and southward to the vicinity of Tuxpan and Papantla. In this area, the fields in the Soto la Marina district (San Jose de las Rusias) and south thereof (El Sabino, &c.) have not been fully developed, though the Corona Company (Royal Dutch, Shell interests) is at work there. But in the fields from the Tamesi southward to the Papantla district there has been much activity and a very large production. In this area, which may be termed the northern Vera Cruz area, the chief fields are as follows :

(a) Potrero-Alazan, Tierra Amarilla, San Marcos, Valles,

¹ Map of Northern Vera Cruz Oil Area in case accompanying this volume.

Los Naranjos, Tepetate, Furbero, in which the Mexican Eagle (Aguila) Oil Company (mainly British: Pearson interests) holds the sole or controlling powers.

(b) Ebano, Chijol, Juan Casiano, Cerro Azul, San Felipe, controlled by the Mexican Petroleum or Doheny group (American).

(c) Panuco, Topila, and Chila-Salinas fields, divided into comparatively small holdings among some 45 companies, including the Royal Dutch and East Coast (American) companies.

(d) Alamo field, controlled by the Penn Mexican Fuel Company (American).

(2) There is a second oil area in southern Vera Cruz, behind the port of Puerto Mexico, where the Mexican Eagle Company possesses the fields of San Cristobal, Soledad, Ixhuatlan, and Tecuanapa.

(3) In Tabasco State, connected by river with the port of Frontera, there is a field of the Mexican Eagle Company at Sarlat, but it is not yet exploited commercially.

In 1917 it was stated that there were in Mexico 919 oil wells, of which 329 were productive, 362 unproductive, 141 in process of sinking, and 77 localized.

Geology.—The upper portion of the so-called Tamasopo limestone, which is of Cretaceous age, is the reservoir rock of the most prolific wells. It is overlain by the San Felipe or Valles beds of argillaceous limestones and shales, some 600 ft. thick, which are also an oil-bearing formation. Above these beds come 2,000–4,000 ft. of marls and shales, traversed in many places by dikes and necks along which there are seepages of asphalt and thick oil. Above these beds again are younger impure limestones and shales of varying thickness which at times contain some oil of superior quality, which has possibly risen from the main reservoir. In southern Vera Cruz the oil is found in a true sandstone and in a limestone intercalated in rocks of Miocene age, and in Tabasco it is found in rocks probably still younger.

Quality of Oil and Products.—The oil from the northern

fields, such as Panuco, Topila, and Ebano, is generally dark or black, and rather heavy. The Ebano oil is specially valuable for the manufacture of asphalt. Farther south the oil is lighter and better, and in the southern Vera Cruz area oils are obtained containing large quantities of good illuminating oil, and some are almost free from asphalt, and yield lubricating oil of high quality, such as is difficult to obtain from the crude oils which are rich in asphalt. Speaking generally, however, 'high-class spirit and kerosene of excellent colour are now manufactured from the Mexican oils, and there is a residue of high calorific value, which is adopted for fuel oil.' Considerable trouble was encountered at first in eliminating the sulphur, but this has been largely overcome. The analysis and specification of Mexican fuel oil is approximately as follows :

Carbon	83.52 per cent.
Hydrogen	11.68 " "
Sulphur	3.27 " "
Ash	0.16 " "
Undetermined	1.37 " "
Specific gravity at 60° F.	about 0.950
Flash point	above 150° F.
Viscosity at 100° F. (Redwood No. 1 n)	1,500 secs.
Calorific value	18,900 B.T.U. per lb.

Wax is also obtained from the oils.

Refineries.—There are a number of refineries. One of the largest is that of the Mexican Eagle Company at Minatitlan in southern Vera Cruz, which is supplied not only from the fields of that area but also from those of the northern area. The same company has another refinery at Tampico. The Pierce Oil Corporation has a large refinery here also, and the Texas Oil, Mexican Petroleum, and Standard Oil companies all have refineries designed or under construction at Tampico.

Storage.—In the Northern Vera Cruz area the storage tank capacity was approximately as follows at the beginning of 1915: steel tankage 16,500,000 barrels; earthen tankage 11,000,000 barrels; concrete tankage 1,250,000 barrels, and since that date capacity well over a million barrels has been

added. The barrel is reckoned as 42 American gallons = 35 Imperial gallons (nearly).

Yield.—The yield of petroleum in Mexico, which was only 3,832,807 barrels in 1910, rose to 14,051,643 barrels in 1911, to 31,867,410 barrels in 1914, and to 55,292,770 barrels in 1917. Only the United States exceeded this last figure, among the oil-producing countries of the world, the Mexican production being estimated at 11·37 per cent. of that of the world. The oil industry was less seriously affected than that of mining by revolutionary disturbances down to 1917, though development was greatly retarded. Nevertheless, it has been asserted that even the large production in 1917 represented only a small fraction of the potential production from existing wells, the output being limited by lack of pipe-lines and other means of transport to the ports, as well as to the shortage of shipping.

Financial Interests.—The financial interests in the oil-fields are very largely American and British. According to a report of 1912 there were then approximately 89 companies organized for oil-production or other operations in the Mexican fields, of which 55 were American, 21 Mexican, and 13 British. The principal British interests, as already indicated, are in the Mexican Eagle Oil Company, with head-quarters in Mexico City, which was incorporated in 1908 under the laws of the republic of Mexico, and acquired in that year and later the oil properties, concessions, and other interests of S. Pearson and Son, Ltd., of London. The authorized capital in 1916 was £60,000,000 Mexican currency. Other British interests are concerned chiefly in the Panuco and Ozuluama districts. Of recent years various questions have arisen between the Government and the oil companies, as for instance that concerning responsibility for the cost of maintaining the breakwaters and the navigable channel at the mouth of the Panuco, and in February 1918 the Government decreed a tax on oil lands which drew a protest from the American, Dutch, French, and British Governments.

Oil Transport

Ports.—The principal oil-exporting ports are Tampico and Tuxpan.

At Tampico, the river Panuco, from the mouth upward, has a number of terminals belonging to various companies, on both banks, with tank 'farms', wharves, and other facilities for dealing with the products of the fields and refineries. The oil is transported from the fields—(a) by the railways serving the port, of which the line westward serves Salinas, Chijol, Ebano, and Valles; (b) by a fleet of steamers (tugs and stern-wheelers) and barges, which convey the oil from the Panuco field by river to Tampico (54 miles), this oil being too heavy to be easily pumped through pipe-lines; (c) by pipe-lines through which the oil is pumped; (d) some use is made of the lagoons behind the coast between Tuxpan and Tampico, and the channels connecting them; this route has been canalized in part, but is difficult to maintain, owing to caving and silting, and the portion southward of Barra de Tanguijo, especially, cannot be regularly used. From the Panuco, the Chijol canal is dredged for about 18 miles, and as far as the Tanguijo mouth vessels with draught of $4\frac{1}{2}$ ft. can navigate. Through Tapamachaco lagoon only a draught of $1\frac{1}{2}$ –2 ft. is possible.

At Tuxpan, which has no main railway connexions, and where the river-bar is inaccessible for large vessels, oil is loaded into these entirely by pumping through sea-lines, which are carried out from the shore into water sufficiently deep for large tank steamers to lie at anchor, mooring stations with buoys being provided by the Mexican Eagle Company to the north, and by the Penn Mexican Company to the south, of the river-mouth.

A similar sea-loading oil-port is in course of establishment at Puerto Lobos, between Tampico and Tuxpan. The first cargo was cleared from this port in June, 1918.

The Mexican Eagle Company has a large oil shipping trade at Puerto Mexico and up the Coatzacoalcas River to Minatitlan.

The same company has planned a loading-station at Frontera in connexion with the field at Sarlat (Tabasco), but, as already stated, this field has not yet been developed.

Railways.—In addition to the lines of the National (Constitutionalist) and Tampico–Panuco railways, which converge upon Tampico, some of the oil companies have local railways. Mule-haulage is sometimes used on these. The chief of these lines are (1915–18) as follows :

<i>Company.</i>	<i>Route.</i>	<i>Gauge.</i>	<i>Miles.</i>
Mexican Eagle . .	La Peña–Potrero	2 ft.	25½
" " " " . .	Cuecillos–Los Naranjos	2	9½
Oil Fields of Mexico . .	Furbero–Cobos (nr. Tuxpan)	2	50½
Huasteca	San Geronimo–Cerro Azul	3	35
" " " "	Cerro Azul–Piedra Labrada	3	4½
" " " "	Cerro Azul–Chapopote (survey)	3	18½
Penn Mex.	Zapotál–Alamo	2 ft. 6 in.	14
Mexican Petroleum . .	Ebano Camp–Main railway	4 ft. 8½ in.	5
Cortez	Saladero–Tepetate	3	12

In southern Vera Cruz the Mexican Eagle Company has a few miles of 2-ft. gauge line.

Roads.—For roads, on which there is some motor traffic, see Appendix II, Routes 114, 119.

Pipe-lines.—Of pipe-lines, through which oil is pumped, there are upwards of 400 miles in all in the Mexican fields. A large number of these lines are short lines between wells and an adjacent loading station, but the total includes the following :

<i>Company</i>	<i>Route.</i>	<i>Diameter of pipes.</i>	<i>No. of pipes.</i>	<i>Miles</i>
Mexican Eagle . .	Potrero–Tampico	6 & 8 in.	1 or 2	99
" "	Potrero–Tuxpan	8	1	32½
" "	Los Naranjos–San Diego	8	1	14
Huasteca	Cerro Azul–Juan Casiano	8	2	22
" "	Tres Hermanos–Juan Casiano	8	1	18
" "	Juan Casiano–Tampico	8	3	65
Penn Mex.	Alamo–Tuxpan	8	1	28
Mexican Gulf . .	Tepetate–Tampico	—	1	60

Occurrence of Oil elsewhere in Mexico.—The existence of oil in Mexico is not confined to the areas mentioned above, though it has not been commercially developed elsewhere, nor does it promise to be so. It is said to be abundant in

Lower California, chiefly on the eastern coast and in Carmen Island. Petroleum or asphalt is known or reported to occur in Durango and Chihuahua, at Lake Chapala in Jalisco, in the Guadalupe suburb of Mexico City, at Salitre de Mendéz in Toluca, near Huauchinango and elsewhere in Puebla, and at various points in Hidalgo, Tlaxcala, Morelos, Michoacan, Oaxaca (near Tlaxiaco, Pochutla, and Puerto Angel), Chiapas, Yucatan, and the territory of Quintana Roo. An attempt has been made by a British company to develop an oil property of 5,100 acres near Pichucálco in north-western Chiapas, but drilling operations have been suspended for some years. It is reported (1918) that drilling has been carried on recently in Yucatan, about 11 miles east of Progreso, under Government auspices through the *Compañía de Fomento del Sureste*.

MANUFACTURES

Metal Industries.—Iron foundries and other metallurgical works are numerous, and, as already seen, include a few large establishments. Probably the most important is that of the Monterey Iron and Steel Company (*Compañía Fundidora de Fierro y Auro de Monterey*: Mexican), which has a blast furnace capable of producing 300 tons a day, three 35-ton open-hearth steel furnaces, and a Bessemer converter. The steel furnaces are heated by gas-producers. Coal and coke are supplied from the Coahuila fields and imported through Tampico, and oil fuel is used in some of the operations, such as the manufacture of bolts, nuts, and rivets. Another important group of iron-works are in Hidalgo and the Federal District—Encarnacion and San Miguel with charcoal blast furnaces and rolling-mills; Apulco, with a blast furnace and foundry, and Delicias, with a rolling-mill. At Zapalpa in Jalisco there is a small blast furnace and rolling-mill, and in Guanajuato there are works of some importance. The requirements of the country are far from fully supplied by home products, and constructional iron and steel, machinery and apparatus, are among the heaviest imports.

Textiles, &c.—It was estimated in 1911 that there were about 145 cotton factories employing 32,000 hands. The largest factories are in or near Orizaba, Puebla, and Mexico City. In the vicinity of Orizaba (Vera Cruz) the Cerritos, San Lorenzo, Cocolapam, and Rio Blanco mills are worked by electricity generated by hydro-electric plants at Rincon Grande Falls, near Orizaba, and Cocolapam. The Metepec mills near Atlixco, Puebla, are also worked by a hydro-electric plant whose turbines develop 5,000 h.p. Other mills of some importance are those of San Antonio Abad in Mexico City, Chalco and Tlalnepantla in Mexico State, and Villa Santiago in Nuevo Leon. The home production of cotton has been estimated to supply about half the requirements of the industry under normal conditions (see further, p. 118).

The principal woollen mills are at Tlalnepantla, and a French company erected modern plant in Mexico City, but the woollen industry is widespread in a number of small works, especially in Mexico State, Aguascalientes, Durango, Guanajuato, Hidalgo, and Puebla. A special production is that of *sarapes* (cloaks or blankets), in the manufacture of which the Indians, notably in Saltillo and Oaxaca, show great skill, using primitive looms in their homes. *Sarapes* of the best grade command high prices.

For linen spinning, weaving, dyeing, and bleaching a British company has a factory in Mexico City. Jute bags, &c., are made by another British concern at Santa Gertrudis, Orizaba, whose works use electric power from a plant of 5,000 h.p. at the Barrio Nuevo Falls of the Rio Blanco. Another jute mill, also using electric power, is at Cuautitlan in Mexico State. Raw material for both jute and flax industries is mainly imported.

Silk, in which material a special product is the *rebozo* or light shawl worn by women, is manufactured at the Santa Maria factory in Mexico City. Under the régime of Diaz some attempt was made to foster this industry by the cultivation of mulberry-trees and the breeding of silkworms.

Leather and Paper.—The chief centres of the tanning

industry are Mexico City and Leon. The country supplies a number of tanning agents, such as *casculote*, *guamachil* bark, oak bark, *timbre* bark, and sumac leaves, principally from the central States, and *palo blanco* from Lower California and Sonora. The manufacture of saddlery is generally a home industry. Modern boot and shoe factories are few and small; the principal are in Mexico City, Puebla, Guadalajara, Mayatlan, Parral, Saltillo, and Monterey. The lower classes commonly wear the native sandals (*guarachas*) or go bare-footed.

Paper is manufactured chiefly in Mexico State, where local wood and water-power are used, and in Tlaxcala, but there is a large import.

Miscellaneous Manufactures.—Cement is made, largely using local material, in modern factories in Hidalgo and elsewhere, but the output does not equal the demand. Bricks and glass-ware are also manufactured in various districts where raw materials are available, but the methods are usually crude. The manufacture of pottery is general; the chief centres are Cuernavaca, Guadalajara, Zacatecas, Guanajuato, and Puebla. Soap and glycerine factories are numerous, using both local and imported materials. The principal factories for cotton-seed oil, soap, and glycerine manufactures are at Chihuahua and Gomez Palacio, and near Torreon also there are important soap and glycerine works. The candle, acid, paint, chemical, and varnish trades are represented among minor manufactures, making use largely of local materials.

The manufacture of sugar has been dealt with in connexion with the crop (p. 112). Meat-packing is an industry established of recent years in Durango and elsewhere; it has not reached an important position. There are breweries with modern plants in Orizaba, Toluca, Monterey, Mexico City, and elsewhere. There are distilleries all over the country (compare p. 110), but the methods used are generally primitive. Fair native wine and brandy are made of the grapes grown in the Parras district of Coahuila and elsewhere. Cigarette-

smoking is universal, and nearly every town and even village have their cigarette factories. Among larger factories are those of Mexico City, Puebla, and Vera Cruz. The manufacture of cigars is comparatively small, though there is normally some export (see p. 121). Matches, especially wax matches, are extensively manufactured.

There is a department of aviation, with a factory and hangars, in the outskirts of Mexico City.

Explosives and Arms.—Establishments for these manufactures under Government control were thus summarized in 1912 :

(a) Cartridge factory at Tacubaya, producing 9,000 cartridges per day with facilities for doubling its capacity. Local materials were used, except for the steel jackets of the bullets, which were imported from Germany.

(b) National powder factory at Chapultepec : cartridge cases manufactured ; gun-shop. Electric furnace. Capacity 500 rifles daily (1918).

(c) Arms factory of Mexico for the repair of arms. Stocks only were manufactured here ; barrels, bayonets, &c., were purchased in Germany, and arms assembled and repaired in the factory.

(d) Arsenal at Vera Cruz for repairs to naval equipment.

(e) Smokeless powder factory at Santa Fe near Mexico City, with an annual output of 100,000 lb.

(f) Arsenal of Mexico ; primarily a workshop for the repair of artillery material. Caissons only were built.

The *Compañía Nacional Mexicana de Dinamita y Explosivos* at Dinamita (Durango) had practically a monopoly for the manufacture of high explosives for mining and military purposes. Its output was about 9,000,000 lb. per year.

WATER-POWER

In concert with the industrial development of Mexico before the recent revolution, important works were carried out or planned for the use of water-power to generate electricity. The high cost of transport of coal would have militated against

industrial expansion by means of steam-power, and industries under more primitive conditions had in great part exhausted the supply of wood in the more populous portions of the country. Electricity has been applied to lighting, heating, and power for transport, factories, and mines.

In consequence of the marked distinction between the wet and dry seasons, and the resulting fluctuation in the discharge of the rivers, it is generally necessary in Mexico to construct storage reservoirs in order to conserve the flood waters for use in the dry season, and thus to regulate the available water-power. The value of a water-power in Mexico depends largely on the possibility of providing for storage of the water.

The financial interests in the large power companies are in great part British, and the majority of the most important companies are registered under Canadian laws in Toronto, as will be seen below.

Necaxa.—The principal hydro-electric establishment in Mexico is that of Necaxa, with its subsidiaries, in the north of the State of Puebla. This belongs to the Mexican Light and Power Company, of Toronto, which owns the share capital of the Mexican Electric Light and the Pachuca Light and Power Companies, but is itself controlled through the holding of shares by the Mexico Tramways Company, also of Toronto.

The Necaxa river is a headstream of the Tecolutla, which discharges into the Gulf of Mexico between Vera Cruz and Tuxpan. The Necaxa and its tributary the Tenango, in their passage from the central plateau to the eastern coastal plain, fall altogether about 3,000 ft. in three miles. The Necaxa formed two main falls of 460 and 740 ft. sheer. Its flow, as between the dry and wet seasons, has shown an extreme range from one to 90 cubic metres per second, so that reservoirs to regulate it were essential. A dam above the gorge into which the river falls is 177 ft. high, 1,300 ft. long at the crest, and 970 ft. wide at the base. The waters of the Tenango are retained by an embankment 3 miles long and 157 ft. at its greatest height. Diverting dams retain the waters of

tributary streams, whose waters are collected in canals and conveyed by a conduit into the Tenango reservoir. To convey these waters there are 26 tunnels with a total length of nearly 20 miles through the hills which separate the valleys of the streams. There are other dams at Laguna and Los Reyes on the upper Necaxa, and six reservoirs have been completed (Necaxa, Tenango, Nexapa, Acatlan, Los Reyes, Laguna), while two more, at Almoloyan and Ayotlan, have been projected. The principal generating station at Necaxa is situated in the precipitous gorge below the lip of the plateau, and is approached by a travelling cage. The building is 265 ft. long, 214 ft. wide, and 65 ft. high, and contains eight generators of the vertical type. The current leaves the dynamos at 4,300 volts, and is stepped up by transformers to 85,000 volts. At this voltage it is transmitted over wires carried on galvanized steel towers 50 ft. high, and running directly across country to Mexico City, 95 miles, and thence to El Oro, a further 76 miles. At Irolo, between Necaxa and Mexico City, there is a distributing station whence current is sent northward to Pachuca and southward to Puebla. There are in all 200 miles of transmission lines. The main generating station has a capacity of about 89,800 h.p. There are three smaller stations in the Necaxa system, at Laguna (two) and Texcapa. The same company has smaller power plants on the drainage canal system of the Valley of Mexico, and at San Ildefonso, which uses water-power made available by the same drainage system, and from small falls near Pachuca. The whole of the company's plant is capable of developing about 132,000 h.p.

All the stations along the transmission lines are connected by telephone, and there are wireless telegraphic installations at Necaxa and in Mexico City. The power supplies tramways, factories, lighting, and heating in Mexico City and at other points, and is used in mining establishments at El Oro and Pachuca ; it also serves pumping stations for irrigation near Mexico City, and machinery at Xochimilco in connexion with the city water-supply.

On more than one occasion advantage has been taken by revolutionaries of the vulnerability of the transmission lines, tramways, &c., and the Company's works have suffered seriously. The whole were taken over by the Government in 1914.

Other Hydro-electric Establishments.—The Puebla Tramway, Light and Power Company of Toronto and London, with which is associated the Anglo-Mexican Electric Company, of London, has concessions for the use of waters of the Atoyac and Los Molinos rivers in Puebla State, and of the Rio Blanco and another Atoyac in Vera Cruz. It supplies electricity for light, heat, and power to the city of Puebla and neighbourhood, owns some 44 miles of tramway (animal traction) in that district, and has a transmission line to the city of Vera Cruz. Current is supplied to cotton spinning and weaving mills along the valley of Puebla (Atoyac), and is used not only in that city, but also in the towns of Atlixco, Cholula, Santo Domingo, Apizaco, Santa Ana, Tlaxcala, Santa Cruz, Panzacola, and San Rafael. The Tuxpango power station, in a deep valley below the main falls of the Rio Blanco, has a capacity of 17,500 h.p., and generates current at 4,000 volts, which is stepped up to 100,000 volts for transmission. There are smaller plants at Portezuelo falls on the Puebla Atoyac (6,500 h.p.) and on Los Molinos river (1,000 h.p.). The development of power on the Atoyac below Cordoba, Vera Cruz, is contemplated.

The Vera Cruz Electric Light, Power and Traction Company, of London, has concessions on the river Antigua, which descends from the Peak of Orizaba, and the Actopan in the same region.

Pachuca, in addition to the supply from the Necaxa station, receives power for mines, mills, and reduction works from a station at Regla, in the east of Hidalgo State, which is worked by means of a canal $11\frac{1}{2}$ miles long, with 11 tunnels.

In the south of Mexico State the Sultepec Electric Light and Power Company, of Toluca, in which there are large American interests, has power plants at Temascaltepec and

San Simonito. The Guanajuato Power and Electric Company, with headquarters at Colorado Springs, U.S.A., works power plants in Guanajuato State at El Platanal, El Sabino, and El Botella, with a total capacity of about 23,000 h.p. Power is transmitted over a distance of 110 miles to Guanajuato City.

In the State of Jalisco the first hydro-electric establishment in Mexico was established at Juanacatlan, where a dam was thrown across the outlet of Lake Chapala in the south-east of the State, and power, principally for lighting, was transmitted to the city of Guadalajara. Subsequently other water-powers have been developed in this State on the Rio Grande de Santiago and tributaries, for the supply of Guadalajara, and of mines in Etzatlan and Hostotpaquillo districts, &c. The Puente Grande plant near Guadalajara has a capacity of 8,000 h.p.

Of recent years schemes have been put forward for the supply of electricity in the mining centres, &c., of the north-west. The Mexican Northern Power Company, of Toronto, took over one of these, the Boquilla scheme in the southern part of Chihuahua. The works were delayed by revolutionary conditions, but were completed in 1916. A lake, 45 square miles in area, at an elevation of about 4,000 ft., has been formed by damming the Conchos River in its upper part, as the river, a powerful torrent during rains, may run dry for months. Three dams were erected, of which the largest, the Boquilla dam, 20 miles west of Santa Rosalia, is 244 ft. high, 312 ft. long, and 201 ft. thick at the base and 866 ft. long and 19½ ft. thick at the top. The mean depth of the lake at the dam is 230 ft. ; its average depth is 60 ft. Pipes through the dam feed Francis turbines, of which four have been installed (with provision for two more), each of 10,000 h.p., and drive three-phase Westinghouse generators for 1,130 amperes and 4,000 volts. The other two dams are walls with overflow weirs. The power-house is in front of the main dam. There is a high-tension transmission system, 47 miles long, to the mines at Parral, of two independent lines carried on steel towers 72 ft. high. In the power-station the current is trans-

formed up to 63,600 volts for transmission. Transmission of power is planned to the Eulalia mines and the city of Chihuahua.

Another extensive scheme, under American auspices, was to make use of the rivers Grande de Santiago, Humaya, Mayo, and Altar, on the northern part of the Pacific slope, in the States of Nayarit, Sinaloa, and Sonora, for the service of tramways, railways, and mines, but it does not appear that any part of this scheme is in operation.

In addition to the works mentioned above, reference is made elsewhere in this volume to the use of electricity from water-power in connexion with some of the industrial establishments named.

INDUSTRIAL CONCESSIONS AND THE CONSTITUTION OF 1917

The Constitution of 1917 lays down conditions as to the development of the natural resources of the land with some particularity, and whatever may be the result of any endeavour to enforce these conditions, their general tendency calls for consideration. The ownership of lands and waters, it is stated, is vested originally in the nation, as also is the direct ownership of all mineral resources, petroleum, salt, and 'other things'. This ownership is inalienable. Concessions are to be granted by the Federal Government to private parties or civil or commercial corporations organized under the laws of Mexico, on condition that the natural resources are regularly developed. Only Mexicans by birth or naturalization have the right to acquire ownership in lands, waters, and their products, or to obtain concessions to develop mines, water-power, mineral fuels, &c., and the nation may grant the same right to foreigners only with the provision that they agree to be considered Mexicans, and accordingly not to invoke the protection of their Governments, in respect to such property, under penalty of forfeiture.

It is provided that within a zone of 100 kilometres from the frontier and 50 kilometres from the sea-coast, no foreigner shall under any conditions acquire direct ownership of lands or waters.

Commercial companies may not acquire, hold, or administer rural properties. Manufacturing, mining, petroleum, or other industrial companies, may acquire or hold lands only of an area absolutely necessary to the development of the industry, as the executive of the Union or of the State concerned shall determine. All contracts and concessions made by former governments in and since 1876 which have resulted in the monopoly of lands, waters, and natural resources by a single individual or corporation are subject to revision, and the executive may annul any such contract which is adjudged seriously to prejudice the public interest.

Other circumstances being equal, Mexicans are to be preferred to foreigners for all kinds of concessions.

Estimates of the money value of foreign interests in Mexico vary, and must be received with reserve, but an estimate of 1912, with an appearance of precision, gave the total of American industrial investments as £211,554,000, British, £64,260,560, and French, £28,693,200.

IMPORTS AND EXPORTS

Statistics are given below for the last financial year (1911-12) for which the figures can be relied upon with any degree of certainty. These more nearly represent normal conditions than those of any later year. Further references to commerce in particular articles will be found in the sections on agriculture, mining, oil-fields, &c.

Imports, 1911-12

	£
Animals and animal products	1,646,631
Vegetable products	3,128,556
Mineral products	4,671,197
Textiles	2 128,157
Chemical and pharmaceutical products	1,207,408
Wine, spirits, mineral and aerated waters	674,408
Paper and paper goods	512,077
Machinery and implements	2,338,381
Vehicles	460,089
Arms and explosives	538,834
Other articles	960,489
Total	£18,266,231

	Exports, 1911-12	£
Gold		4,990,511
Silver		8,956,835
Other metals and minerals		4,673,332
Vegetable products		8,358,695
Animal products		1,986,119
Manufactured goods		660,357
Other articles		173,060
Total		£29,798,912

Chief Countries trading with Mexico, 1911-12

	Imports into Mexico.	Exports from Mexico.
	£	£
United States of America	9,842,567	22,410,322
United Kingdom	2,150,630	4,019,865
Germany	2,384,521	1,031,673
France	1,561,825	832,982

SHIPPING

According to a list of 1917-18 the total number of merchant steamers and tugs of 100 tons and upwards, flying the Mexican flag, is 32 with a total tonnage of 32,673 tons, and the total number of sailing vessels of 50 tons and upwards is 16 with a total tonnage of 2,630 tons. Practically all the vessels which are not tugs are in the coastal trade, and nine-tenths of the total tonnage belongs to Atlantic ports. Most of the vessels are under 1,000 tons, but the *Compañía Mexicana de Navegación* owns a number of vessels between 2,000 and 3,000 tons and one, for carrying oil in bulk, over 5,000 tons. The *Compañía Naviera del Pacífico*, according to the list quoted, has reduced its fleet to two small vessels, but it has also been reported recently that this company had sold all its vessels and plant. Two were bought by the American Mexican Steamship and Trading Co. of San Diego. The Boleo Copper Company of Santa Rosalia has three vessels, of which the largest is 916 tons. The Mexican Government owns two steamers which ply between Gulf ports and ports in Yucatan east of Progreso which are served by no steamship line.

In the year 1911-12, the last for which statistics are avail-

able, the total numbers of entrances and clearances at Gulf ports of Mexico were 6,406 and 6,312 respectively, and at Pacific ports 3,948 and 3,830 respectively. No complete statistics of the nationality of the vessels are published, but United States steamers preponderated. In 1913 the number of vessels which cleared Mexican for British ports was 77 (total tonnage, 197,986). The number which entered Mexican from British ports was 99 (total tonnage, 297,631).

Statistics of the shipping (exclusive of Mexican vessels) of certain ports of Mexico, taken from Consular Reports, are as follows for the last years for which figures are available.

Total Foreign Shipping entered, 1912.

	SALINA CRUZ.		ACAPULCO.		MANZANILLA.		MAZATLAN.	
	<i>No. of vessels.</i>	<i>Total tonnage.</i>	<i>No. of vessels.</i>	<i>Total tonnage.</i>	<i>No. of vessels.</i>	<i>Total tonnage.</i>	<i>No. of vessels.</i>	<i>Total tonnage.</i>
British . . .	96	82,524	3	10,908	11	24,584	4	10,710
United States .	141	409,948	72	171,444	21	48,505	31	52,224
Japanese . . .	8	36,883	—	—	10	80,426	—	—
Norwegian . . .	6	5,242	1	4,739	10	22,585	8	12,482
German . . .	—	—	—	—	8	33,831	10	31,210

	PUERTO MEXICO.		VERA CRUZ.		TAMPICO.		TUXPAN.	
	<i>No. of vessels.</i>	<i>Total tonnage.</i>	<i>No. of vessels.</i>	<i>Total tonnage.</i>	<i>No. of vessels.</i>	<i>Total tonnage.</i>	<i>No. of vessels.</i>	<i>Total tonnage.</i>
British . . .	67	184,359	111	262,046	195	423,089	14	57,114
United States .	72	279,700	71	291,552	141	206,830	9	15,371
French . . .	—	—	25	191,468	13	46,610	—	—
Spanish . . .	—	—	24	126,426	—	—	—	—
Norwegian . . .	16	34,912	40	87,185	34	41,279	2	3,998
Italian . . .	—	—	2	7,102	—	—	—	—
German . . .	2	4,945	55	291,553	118	300,239	7	26,838
Austro-Hungary	—	—	1	3,621	—	—	—	—
Danish . . .	—	—	4	11,563	4	8,342	—	—
Swedish . . .	—	—	—	—	3	4,707	—	—
Dutch . . .	—	—	—	—	2	8,131	—	—
Belgian . . .	—	—	—	—	24	39,419	—	—
Cuban . . .	—	—	—	—	35	70,379	—	—

Statistics of subsequent years, where obtainable, show a disproportionate increase in United States shipping. This is due to the law passed in 1915 allowing foreign-built ships owned by American companies to obtain United States

registry. Many ships were in consequence transferred from foreign flags.

LABOUR

The geographical distribution of labour is closely controlled by the geographical conditions of the country. In the hot lands of the coasts and elsewhere, where the population is scanty, labour is very scarce and wages run higher than in the cooler elevated districts, where labour has been, at some periods at least, in excess of the demand. Migration from the cool to the hot lands is distasteful to the Mexican, and the transference of labour has proved difficult.

The course of mining, agricultural, and industrial development in recent years has given rise to many labour problems. It seems clear from various accounts that there has been no little amount of improper exploitation of labour, taking advantage of the small needs of the Mexican worker, and his inexperience in modern industrial machinery and methods. Towards the end of the Diaz régime, on the other hand, Mexican labourers were in many cases stirred by mischievous agitators, and of the numerous strikes which occurred some were certainly unjustified. The Constitution of 1917, which contains a new 'title' (no. vi) laying down provisions concerning labour with considerable minuteness, recognizes syndicates, unions, and strikes under certain provisions: lock-outs are legalized only when 'excess of production shall render it necessary to shut down in order to maintain prices reasonably above the cost of production'.

An eight hours' day (to which seven hours of night labour is equivalent) is prescribed by the Constitution for adults, and a six hours' day for children from 12 to 16 years old. Unhealthy and dangerous work, and night work in factories, is forbidden to women and to children under 16 years old.

One day's rest for six days' labour is prescribed for all workmen. In this connexion it may be remarked that foreign employers of Mexican labour of any sort have commonly complained of the difficulties arising from the frequent

holidays demanded by custom or religious practice. The Roman Catholic clergy encouraged a large number of feast days, which were profitable to the Church. It used to be calculated that over one-third of the year, in addition to Sundays, was given up to religious festivals which prohibited work. Although as early as 1858 legislation was directed against this condition of affairs, it persisted in a greater or less degree in different localities, and at the present day Mexican labour is to some extent unreliable on this account. Public holidays are stated now to fall on the following days :

*New Year's Day.	June 24.
January 6 (Epiphany).	June 29.
*February 5 (Constitution Day).	*July 18.
*Tuesday before Ash Wednesday.	August 15 (Assumption).
*Good Friday.	September 8.
*Easter Monday.	*September 16.
*Easter Tuesday.	All Saints' Day.
*May 5.	All Souls' Day.
Ascension Day.	December 8.
*Corpus Christi.	December 12.
	*Christmas Day.

On days marked with an asterisk Government offices and business houses are usually closed ; on other days of religious festivals business houses commonly close in the afternoon.

The Constitution enjoins upon employers the provision of comfortable and sanitary dwellings, for which a rent may be charged not exceeding $\frac{1}{2}$ per cent. per month of the assessed value of the property. They are also to establish schools, dispensaries, &c. Employers' liability for accident and disease arising from employment is specified.

WAGES

The Constitution prescribes a minimum wage, which is to be taken as that considered sufficient, according to the conditions prevailing in the respective regions of the country,

'to satisfy the normal needs of life of the workman, his education and lawful pleasures, considering him as the head of a family'; there is to be no differentiation, however, between the sexes. In all agricultural, commercial, manufacturing, or mining enterprises, it is laid down that workmen have the right to participate in profits, on a basis to be determined by special commissions in each municipality, subordinated to a conciliation board in each State. Wages must be paid in legal currency. Overtime must be paid at a rate of 100 per cent. more than the wages for regular time. Men must not work more than 3 hours' overtime per day, and on not more than three days consecutively; overtime is forbidden for women and for children under 16 years old.

It is impossible to specify wages exactly, because it is evident that they vary very largely as between one district and another, mainly on account of the geographical distribution of labour to which reference has been made, and of the varying conditions of living in various districts, which are recognized in the provision of the Constitution quoted above. Moreover, there is evidence that, in sympathy with the depreciation of Mexican currency in recent years, wages have been substantially advanced in some departments of labour, though not in others. It was calculated in 1910 that the *peon*, the agricultural labourer, in the cold and temperate regions, received an average wage of \$0.37 per day Mexican currency; on the other hand earlier estimates show a range from a minimum average of \$0.19 in Aguascalientes and Nuevo Leon up to a maximum average of \$0.50 in such territories as Lower California and Chiapas, and \$0.65 in Sonora. Estimates made towards the end of last century showed such average wages as the following: bricklayers and masons, \$1-1.50 per day; labourers (town), \$0.37-0.67 per day, (country) \$0.10-0.15 per day; carpenters, \$1.50-4.75 per day; locomotive engineers, \$150-250 per month; locomotive firemen, \$75-100 per month; stationary engineers, \$3.50-5 per day; iron workers, \$2-2.50 per day; factory hands, \$0.50-1 per day; skilled labourers, \$1.50-2 per day;

mechanics, \$3.50-5 per day ; mining labourers, \$0.50-0.80 per day. These figures have certainly been considerably modified, and did not represent average conditions throughout the country, so that they afford little more than a rough indication. Again, under revolutionary influences, an extravagant inflation of wages appears to have taken place in some localities. Thus in Yucatan the Government recently forced the wages of native henequen harvesters from \$0.10 per day up to \$1.00 and all found, whereupon the planters imported Korean labour : stevedores loading henequen at Progreso are said to have earned \$50.00 a day in some instances. In 1916, the following figures were given for workers in the oil-fields, in Mexican currency, per day : labourers, \$1.50-6 ; Mexican drillers, \$1.50-4 ; American drillers, \$7.25-10.25 ; chief drillers, \$20. It may be added that the new Constitution provides against any distinction between Mexicans and foreigners in the matter of wages.

FINANCE

Revenue and Expenditure

The financial condition of Mexico is at present chaotic, and though the following tables serve to illustrate the decline of financial stability since the revolution, and the principal sources of federal revenue and directions of expenditure, the figures bear little relation to conditions of the moment, and in later years are certainly untrustworthy. The figures are those of Mexican *pesos* or dollars (see p. 157), and are rounded.

<i>Fiscal Year.</i>	<i>Revenue.</i>	<i>Expenditure.</i>
	\$	\$
1907-8	111,771,900	93,177,400
1908-9	98,775,500	92,967,400
1909-10	106,328,500	95,028,700
1910-11	111,142,400	100,913,900
1911-12	105,203,100	96,986,100
1912-13	120,958,900	110,781,900
1913-14	129,607,000	129,412,600
1914-15	145,957,000	152,204,900

The figures for 1911-12 and for 1914-15 may be compared in detail—

<i>Revenue.</i>	1911-12.	1914-15.
	\$	\$
Taxes on foreign commerce	45,341,800	57,875,000
Federal internal taxes	32,777,800	57,761,000
Special taxes in Federal District and territories	12,365,600	14,432,000
Posts and telegraphs	7,406,800	7,400,000
National property, lottery, and minor sources .	7,311,100	8,389,000
Railways	—	100,000

Of the taxes on foreign commerce, import duties represented about 93 per cent. in the former year.

<i>Expenditure.</i>	1911-12.	1914-15.
	\$	\$
Legislature	1,327,400	2,279,800
Executive	233,600	361,600
Judiciary	612,900	792,400
Dept. of Foreign Affairs	2,143,000	2,319,600
„ Interior	14,261,000	19,089,000
„ Justice	1,644,000	2,033,100
„ Public Instruction	7,576,800	9,917,600
„ Fomento, Industry, &c.	3,345,700	4,309,600
„ Communications	13,594,800	14,758,000
„ Finance	34,165,500	41,178,800
„ War and Marine	18,081,400	55,165,400

Of the sums set down for the department of finance, about 75 per cent. represents national-debt charges. The heavy increase in expenditure for certain departments in 1914-15, especially for that of war, in comparison with the earlier year, is mainly connected with measures for the ' pacification ' of the country, the restoration of economic conditions, &c., which have not been justified by results.

Loans and National Debt

Under the régime of Diaz and the finance minister Liman-tour Mexican credit reached a standard not only above that of other Latin-American states, but also above that of more than one European country. On the outbreak of the revolution, this credit quickly collapsed. The federal loans issued down to the close of the Diaz régime are as follows. The sums in dollars are gold, not Mexican *pesos*.

\$43,530,925 consolidated internal 3 per cent. silver bonds.
\$96,615,100 5 per cent. internal redeemable bonds, issued in and since 1895.

\$22,700,000 5 per cent. external consolidated gold loan of 1899. This loan is nominally secured by hypothecation of 62 per cent. of the federal import and export duties. In 1911 £10,433,820 of the bonds were drawn and paid off, largely out of the proceeds of the loan of 1910, below.

\$40,000,000 4 per cent. gold bonds of 1904, for which a sinking fund was provided for their redemption in 50 years.

£11,100,000 4 per cent. external gold loan of 1910, destined for the conversion or redemption of the 5 per cent. loan of 1899, and similarly secured, subject to the outstanding balance of that loan, on 62 per cent. of the import and export duties.

In addition, there was incorporated with the federal finances in 1903 the City of Mexico 5 per cent. loan for £2,400,000, of 1899, which was issued for the purpose of carrying out works for the improvement of the water-supply of the city and the drainage of the city and the valley of Mexico. There are also certain collateral obligations, guaranteed by the federal credit but not included in the national bonded indebtedness, consisting of National Railway and Tehuantepec Railway bonds, and the Caja de Prestamos loan. This last is a loan of 50,000,000 *pesos*, guaranteed by the Federal Government as to principal, interest, and sinking fund, to a company (*Caja de Prestamos para Obras de Irrigacion y Fomento de la Agricultura*), in which the Banco Nacional, Banco de Londres y Mexico, Banco Oriental, and Banco Mexicana de Comercio y Industria (p. 160) are concerned. It was formed to grant loans for the purposes of irrigation, agricultural works, and stock raising, and to lend sums to the Federal Government in connexion with schemes of land subdivision.

The interest and other charges on the above loans fell generally into arrear in or about 1914.

In 1913-14 the Huerta Government issued bonds of

260,000,000 *pesos* (but of these 56,500,000 *pesos* were not disposed of), Carbajal also arranged a small loan, and later the Constitutionalist Government made an issue of paper amounting to 300,000,000 *pesos*, intended to replace all older paper, which was called in. This new paper, however, was issued both by Carranza at Vera Cruz and by Villa at Mexico City, and became worthless (see under *Currency*, below).

In May 1911, at the end of the Diaz régime, the national debt in round figures was 440,000,000 *pesos*, and the collateral obligations referred to above amounted to 461,000,000 *pesos*. By 1916 it was estimated that the bond issues of Huerta and Gutierrez, the paper currency and bank notes issued by the Government, and the defaulted interest and maturities on the National Railway bonds, &c., had raised the national debt to 1,000,000,000 *pesos* and the collateral obligations to 1,121,300,000 *pesos*. In August 1917, however, President Carranza was reported to have stated that the revolution had increased the national debt by only \$125,000,000 gold, and that his Government repudiated the debts of the Huerta regime and the paper money issued by Villa and others. He estimated the disbursements on account of the revolutionary movement at \$96,000,000 gold and \$855,000,000 paper, and set against this revenues of \$75,000,000 gold and \$236,000,000 paper. The difference he took to represent the cost of the revolution, which he reduced to \$125,000,000 gold principally by assigning a value of 20 cents gold to each outstanding legitimate *peso* (\$) paper. This statement is quoted (for what it is worth) as the latest available at the time of compiling this notice, but the value assigned to the paper *peso* appears to be purely arbitrary (compare p. 157). At the same time, it was asserted that the receipts of the federal treasury were rapidly increasing.

Nevertheless, the Carranzist Government, during 1915-18, has been in extremity for want of money. In accordance with its doctrines, one method proposed for refilling the treasury has been that of confiscating the properties of foreign corporations, or of heavily taxing their output.

And this method has not been directed solely against foreign interests, for the hemp planters of Yucatan (for example) were compelled to pay over to the federal treasury a large proportion of the value of their production (see p. 117)., and it has been stated that the Government drew the largest part of its revenue from Yucatan. In August 1917 it was reported that an American financial adviser to the Mexican Government had been appointed, and that the Mexican Congress had approved the issue of a loan of \$150,000,000 to cover deficit, \$50,000,000 for railway reconstruction, and \$100,000,000 for the establishment of a new central bank. Statements concerning projected loans from American, Japanese, and German sources have been made, but none of these has materialized, and there is little prospect of stabilized government and conditions of prosperity unless a large foreign loan is obtained.

The finances of the several States appear to be in no better condition than those of the federation. State governors have faculties to dispose of the States' revenues as they choose, and corruption is common. It was so even under the régime of Diaz, but he did not allow any State to reach the condition of bankruptcy, and some, notably Yucatan, Guanajuato, Vera Cruz, Oaxaca, Chihuahua, Queretaro, and Nuevo Leon, had considerable reserve funds; these disappeared after his time.

CURRENCY

The monetary unit is the silver *peso* or dollar, of a legal value of 0.75 gramme of pure gold. It is divided into 100 cents or *centavos*, and there were gold coins of 10 and 5 *pesos*, silver coins of 1 *peso* and of 50, 20, and 10 cents, nickel coins of 5 cents, and bronze coins of 2 cents and 1 cent. A law of June 1917 established the size and weight of silver and gold coins, and authorized the striking of a new gold coin of 20 *pesos*. The value of the *peso* under normal conditions was 24.58 pence. The metallic currency, even for the smallest denominations, entirely disappeared during the revolution,

and an enormous quantity of paper (or cardboard) money came into circulation. Not only the Governments but Villa and other revolutionaries have issued paper, which may be summarized thus : (1) bank notes (State banks), which largely disappeared during the revolutionary period, being negotiated at 10 to 40 cents American gold per *peso*, according to the bank of issue ; (2) Madero's *ejercito constitucionalista*, notes known as ' *dos caras* ', which became worthless as the revolution progressed ; (3) small issues of the various revolutionaries, put into forced circulation by them in their own different districts ; used by them to purchase cattle, &c. (compare p. 123) ; worthless ; (4) Carbajal's notes, called *bonos*, which for some time were accepted in commerce, &c., despite the prohibition of Carranza or Villa, but gradually disappeared ; (5) the issue of 300,000,000 *pesos* referred to on p. 156, which failed in its object of creating one uniform paper currency, and, as will appear below, became practically worthless, the banks dealing in foreign exchange refusing it in payment for American gold drafts ; (6) ' *Infalsificables* ', referred to in the following paragraph.

As an illustration of the condition into which the currency was brought under the revolution it may be mentioned that in May 1916 the value of the paper *peso* of Carranza's *de facto* Government was about 1½ cents American gold. The Government wished to enforce a value of 10 cents gold per *peso*. This caused confusion in business and trade ; among other serious results, it became extremely difficult for the people to buy food. A new paper currency was substituted for the old, nominally with a guarantee in gold of 20 cents for each *peso*, and the Government proposed to issue no more paper than it was able to guarantee on those terms. Meanwhile traders used the old money, but made every endeavour to avoid being paid in it. The new or ' *infalsificable* ' paper money in its turn became practically valueless, and for some time almost ceased to circulate. In November 1916 gold and silver were decreed to be the only legal tender, but this measure lapsed, for in March 1917 it was decreed that in the

payment of import and export duties and the stamp tax on petroleum and metals, one dollar 'infalsificable' paper should be paid with each gold dollar, thus obliging all taxpayers who might still hold this paper to hand it over gradually to the Government, and all who had divested themselves of the paper to repurchase it. Speculation in paper money consequently revived, but at widely different values, and many tradesmen offered to accept it at their own valuation, in the hope of making a profit on it.

When it was found impossible to enforce the provision that import duties should be paid in Mexican metallic currency, as this was lacking, the Government allowed American gold bank notes to be accepted at a premium of 15 to 20 per cent., and commerce generally followed suit. This premium raised the value of the silver *peso* to about 30 pence. American bank notes are freely taken, on this basis, even in small shops. Large manufacturers, even Mexicans, bank in the United States to a great extent, and pay large amounts by drafts on New York.

In spite of the efforts of the Government, paper money became worthless and disappeared. Immediately metallic currency, of which there was a great shortage, went to a premium. Mexico, in the middle of 1918, was bankrupt on a metallic basis.

BANKS

The effects of the revolution upon the banking system of Mexico have not clearly emerged, but of the banks mentioned below the strongest early in 1918 were said to be the Nacional, Londres y Mexico, Oriental, and Vera Cruz. These are supposed to have profited substantially during the revolutionary period by receiving and destroying their own notes and paying out those of the Constitutionalist issue before their value practically disappeared. On the other hand, in July 1918 all the chartered banks except the Internacional e Hipotecario were in Government hands, and their cash had been

commandeered. The establishment of a new bank of the Republic, as already stated, was promulgated in 1917, to be under Government direction and have control of the entire paper currency, and to hold a deposit of 50 per cent. gold and silver against the paper issue. But down to the middle of 1918 the Government had wholly failed to establish such a bank.

As even revolutionary opinion admits the financial ability of Limantour, who as minister of finance under Diaz reorganized the system, this may be briefly described. The banking system was based upon a plurality of banks of issue, so that in addition to the National Bank (*Banco Nacional*) of Mexico, with headquarters in Mexico City, there are banks, in a number of States, which are allowed to issue notes under conditions which, without establishing an absolute monopoly, tended to encourage one strong bank in each State. These local banks of issue, however, do not exist in every State. The denominations of Mexican bank notes are limited to \$5, \$10, \$20, \$50, \$100, \$500, and \$1,000 Mexican currency. The security of any notes depended upon the solvency of the individual bank issuing them, and in this respect the system was weak ; so a *Banco Central* was created, in which each State bank should possess shares to the amount of at least 10 per cent. of its nominal capital. The Banco Central acted as a central agency for mutual support among the State banks.

In addition to banks of issue, there are mortgage banks issuing bonds to cover loans on real estate, and banks of promotion, issuing treasury bonds to cover loans to industry or agriculture.

In addition to the Banco Nacional (whose capital is largely French) and Banco Central, the principal chartered banks in Mexico City in 1913 were the Banco Hipotecario de Credito Territorial Mexicano, Banco Internacional e Hipotecario de Mexico, Banco de Londres y Mexico (capital largely French), and Banco Mexicana de Comercio y Industria (capital largely German). Among the chief independent banks were the

Mexican Banking Co. (American), the Canadian Bank of Commerce (head office, Toronto), the Bank of Montreal, the International Banking Corporation (head office, New York), and the Banco Germanico de la America del Sur (head office, Berlin).

The following table shows, in each State or territory, the towns in which branches or agencies of the National Bank, and local chartered banks (indicated by asterisks) were established in 1913.

<i>State or Territory.</i>	<i>Towns with branches or agencies of National Bank, and with local chartered banks (*).</i>
Aguascalientes	Aguascalientes*.
Campeche	Campeche.
Chiapas	Tapachula, Tuxtla Gutierrez.
Chihuahua	Ciudad Juarez, Chihuahua**, Parral.
Coahuila	Monclova, Piedras Negras, Saltillo*, Torreon*.
Colima	Colima.
Durango	Durango*.
Guanajuato	Celaya, Guanajuato*, Irapuato, Leon.
Guerrero	Acapulco, Bravos, (Iguala†).
Hidalgo	Pachuca*, Tulancingo.
Jalisco	Autlan, Guadalajara*, Lagos, Zapotlan.
Lower California	(none).
Mexico	Toluca*.
Michoacan	La Piedad, Morelia*, Puruandiro, Uruapan, Zamora.
Morelos	Cuernavaca*.
Nayarit	Tepic.
Nuevo Leon	Monterey**.
Oaxaca	Oaxaca.
Puebla	Puebla*, Tehuacan, Teziutlan.
Queretaro	Queretaro*.
Quintana Roo	(none).
San Luis Potosi	Matehuala, Rio Verde, San Luis Potosi*.
Sinaloa	Mazatlan*.
Sonora	Guaymas, Hermosillo**, Nogales.
Tabasco	San Juan Bautista*.
Tamaulipas	Ciudad Victoria, Nuevo Laredo, Tampico*.
Tlaxcala	(none).
Vera Cruz	Cordoba, Jalapa, Orizaba, San Andres Tuxtla, Tantoyuca, Vera Cruz*.
Yucatan	Merida*.
Zacatecas	Sanchez Roman, Sombrerete, Zacatecas*.

† Iguala has no branch of the National Bank.

The most important of the local chartered banks, according to amount of capital, were the Banco Peninsular Mexicano

(head office, Merida, Yucatan), the Banco Oriental de Mexico (head office, Puebla), the Banco de Jalisco (Guadalajara), the Banco de la Laguna, Refaccionario (i. e. bank of promotion ; Torreon, Coah.), the Banco Minero de Chihuahua, and the Banco de Vera Cruz.

WEIGHTS AND MEASURES

The only legal weights and measures are those of the metric system. But old Spanish measures are still commonly used, especially among the lower classes and Indians. The more important of these measures are as follows :

Linear Measures

1 legua (league)	5,000 varas	4.19 kilometres	2.6 stat. miles
1 marine league	6,662 $\frac{2}{3}$ "	5.58 "	3 naut. miles
1 vara	3 pies	0.84 metre	2.75 ft.
1 pié	12 pulgadas	0.28 "	0.92 "
1 pulgada	12 líneas	0.023 "	0.92 in.
1 línea	—	0.002 "	0.076 "

Measures of Area

1 manzana	= 1.66 acre
1 fanega	= 8.81 acres
1 caballería	= 64 manzanas = 105.75 acres
1 sitio de ganado mayor	= 4,338.11 acres

Dry Measures

1 carga	2 fanegas	181.63 litres	5.15 bushels
1 fanega	12 almudes	90.81 "	2.58 "
1 almud	4 cuartillos	7.57 "	0.86 pecks

Liquid Measures

1 cuartillo of oil	—	0.51 litre	0.89 pint
1 cuartillo of wine	—	0.46 "	0.80 "

Commercial Weights

1 carga (in freighting)	12 arrobas	138.07 kilogrammes	303.75 lb. av.
1 quintal	4 "	46.02 "	101.24 "
1 arroba	25 libras	11.51 "	25.32 "
1 libra	—	0.46 "	1.01 "

CHAPTER VI

TOPOGRAPHY AND COMMUNICATIONS

Towns—Roads—Railways—Tramways—Telegraphs—Postal arrangements
—Steamship lines—Coastline, harbours and anchorages—Lighthouses.

TOWNS

IN Appendix I will be found a gazetteer of all the State capitals and other important towns. Mexican towns are as a rule regularly planned, with the streets crossing at right angles. The blocks are usually closely built on the street front in the centre of the towns, with *patios* (courtyards) often more or less built over, in the interior of the blocks. The houses are of *adobe* (mud), stone, or brick, with roofs, generally flat, of *azotea* (burnt brick), corrugated iron, or tiles; they have, as a rule, only one story, though buildings of two and sometimes three stories are common in the business quarters of the towns. Where electric light is installed it is found in the streets and in the better-class houses and shops, the poorer class of buildings being lit by oil lamps. There is, as a rule, no gas supply, heating being confined to the old-fashioned fire-places, on which the cooking is done. There is generally no fire brigade, but the police often have lengths of hose, and an alarm of fire is given by police whistles and church bells. The most common industries, which are carried on in the majority of the larger towns, include the manufacture of wool and cotton garments and material, of cigars and cigarettes, sweets, hats, shoes, wax matches, leather goods, soap and oils, ice, sugar, and alcohol, with brewing and distilling, flour-mills, potteries, and tanneries.

ROADS

In Appendix II will be found short itineraries of the principal roads, so far as it has been possible to trace them,

but, as will appear from the accompanying map¹, information is wanting for certain districts.

The bad condition of roads in Mexico is remarked upon by all travellers. 'For "road" in Mexico always read—at best a winding stretch of dried mud with narrow paths meandering through the smoother parts of it, the whole tumbled everywhere with stones and rocks and broken by frequent unexpected deep cracks and stony gorges.' (H. A. Franck, 1916.) There may be some exaggeration in the above statement, but evidence from both official and private sources points to a general and increasing neglect in the maintenance of Mexican roads, especially since the advent of railways. In regions not provided with railway communications spasmodic attempts were made under the Diaz Government to construct well-planned federal roads, with easy grades, substantial bridges, and properly metalled surface. Typical examples are the roads from Chilpancingo to Iguala (see Appendix II, Route 75), and the motor road to Chapala (Route 33). But as a rule road construction was left to the initiative of individual states and to municipalities, with the result that little was attempted. Some mining concerns, however, had found it advisable to establish connexions with the nearest railways by means of well-built roads. Although since the upheaval of 1910 matters have naturally gone from bad to worse, it is probable that many of the existing roads could easily be repaired; especially those built under Spanish rule, those from Vera Cruz to Mexico City for example (Route 125), which excited the admiration of Humboldt, and have often been compared with the finest Alpine roads.

It must also be admitted that in Mexico the civil engineer is confronted with the greatest obstacles. Differences of elevation are enormous. From the coast the tableland of the interior can only be reached by crossing rugged mountain ranges with steep declivities. Even stretches of comparatively level country are commonly cut up by cañons and barrancas,

¹ Map of roads and tracks in case accompanying this volume.

deep narrow gorges, characteristic of the country. Water-courses vary considerably in volume ; most of them are of the nature of torrents, swelling after rain, and running dry during the rainless period.

Official accounts divide roads into two main classes : *camino carretero* or carriage-road, and *camino de herradura* or horse-track. It should be noted, however, that although the *caminos reales* or ancient highways are included among the first, the term *camino carretero* does not necessarily imply that the road is more than a trail or a natural track sufficiently wide to allow the passage of such vehicles as the two-wheeled ox-carts or the native diligence drawn by a team of mules. Such roads are found in the coastal zones and on the central plateau. On the other hand, across the Sierra the *camino de herradura* is the rule. It is seldom more than a narrow path, just wide enough to allow mules and horses to pass in single file. Often it is bounded on one side by a rocky wall and on the other by a deep precipice.

Excepting a few highways specially prepared for motor traffic, a systematic metalling of roads does not appear to have been attempted. The surface varies therefore according to the nature of the soil over which the road passes. Near the coast it is often sandy ; inland it is either stony and rugged, or consists of a kind of loess, very muddy in rain, and correspondingly dusty in dry weather, into which deep furrows are worn by the traffic. The sections which cross lava fields are particularly trying to the hooves of horses and mules. Through the towns roads are often cobbled, and not infrequently the paving is continued some distance outside the towns. Sometimes, especially in Guerrero, one-half only of the road is paved, in alternating sections, about one hundred yards in length, first on the left and then on the right, both sides sloping towards the centre which forms the gutter. Unless such pavements are repaired annually after the rainy season, the stones become dislodged and are an additional hindrance to traffic.

Bridges.—Substantial stone bridges exist along some of the *caminos reales*, such as Route 125; on other roads permanent bridges are the exception, and rivers have to be forded or crossed by ferries. Steam ferries are available on some of the larger rivers. Occasionally a railway bridge may be situated in the immediate neighbourhood of the road. In the Sierra torrents are not infrequently crossed by wooden bridges, generally in a tottering condition, or at best of the crudest type; many consist of tree-trunks laid side by side, and resting at both ends on loose blocks of stone. As many of the rivers cease to be fordable in the rainy season, the natives sometimes span them with temporary suspension bridges (*puentes colgantes*), which are taken down as soon as the flood subsides.

RAILWAYS

Development of Railway System

The railway system of Mexico¹ has not been developed upon any settled plan. There are, therefore, notable gaps in the lines of communication, and considerable overlapping in the different routes. Nevertheless, the greater part of the country is supplied with an extensive system of through railways, with numerous branches, while Yucatan has a separate system, unconnected with the rest. In 1913 the total length was given as 15,732 miles; but of these railways 3,230 miles were purely local lines constructed under concessions granted by the various states. Since that date various lines have been constructed or completed, but certain others have been abandoned.

In conformity with the general relief of the land, the main lines of communication by rail are for the most part longitudinal, and the want of lateral communications is marked in some parts, especially in the north. Thus, there is a scheme to connect the Gulf of California by a line near the

¹ Map of railways in case accompanying this volume.

northern frontier with the mouth of the Rio Grande on the Gulf coast, and to form a port at the latter point.

The development of the railway system until recent years was mainly through the enterprise of private individuals, assisted by subventions from the Government. In this, or similar ways, twelve great systems were developed, which will be alluded to under their old names. These systems are the National, Mexican Central, International, North-Western, Southern Pacific (including the Sonora Railway), Mexican, Interoceanic, Vera Cruz and Isthmus, Mexican Southern, Pan-American, and the Kansas City, Mexico, and Orient railways. The Tehuantepec National Railway, across the Isthmus of Tehuantepec, was partly a State (federal) and partly a private concern.

Government Control of Railways

It became apparent, however, to the Mexican Government that the system of individual ownership, owing to the operations of powerful financial groups, which were endeavouring to secure control of the through routes, entailed a certain danger to the State, and the Government initiated a movement which aimed at securing control of the principal lines by obtaining a majority of the shares of the different companies. In this manner a preponderating interest was secured in the old National Railroad (which had obtained control of other railways), the Hidalgo and North-Eastern, and the International; and in 1909 the Government further strengthened its position by securing control of the Mexican Central system. These railways were combined as the National Railways of Mexico, and vested in a company formed under the laws of Mexico on July 6, 1907, the larger portion (about 55 per cent.) of whose stock is held by the Mexican Government. The most important line then remaining outside this system was the Mexican Railway. Other important interests, however, were afterwards created, and the National Railways subsequently

acquired control or ownership of the Mexican Pacific, the Interoceanic (which operates the Mexican Southern) the Vera Cruz and Isthmus, the Pan-American, and the Texas-Mexican railways.

In 1912 capital in Mexican railways was approximately estimated to be distributed as follows :

<i>Capital.</i>	<i>In Railway stocks.</i>	<i>In Railway bonds.</i>
	£	£
American	47,093,000	81,785,000
British	16,248,000	17,536,000
French	—	3,400,000
Mexican	25,088,000	2,455,000
Other	15,000	7,708,000

The Constitutionalist Railways.—The present position is complicated by the fact that the Government has seized and operated the various lines under the plea of necessity. These lines have either been merged in the national system, which is now called the Constitutionalist Railways, or have been operated directly by the Government, nominally on behalf of their shareholders. In speaking of the Constitutionalist Railways, therefore, what is really meant is those lines which have been taken over and operated by the Government, either permanently or temporarily, under the Decree of Dec. 4, 1914. That decree gave the federal authorities the right to take over ' whenever, in their judgement, it may be necessary to do so for the defence of the country, all the railroads ', subject to an indemnity to their private owners. At the present time these indemnities and the interest due to bondholders must amount to enormous sums. In addition to the National Railways, the Mexican¹ and the Tehuantepec lines have been taken over, together with certain shorter lines referred to in Appendix III. The United Railways of Yucatan have also been taken over as the Constitutionalist Railways of Yucatan.

¹ The Mexican Railway was controlled and worked by the Government from January 1915 to August 1916, and was again taken over in April 1917.

Summary of Main Lines and Principal Connexions

Appendix III in this volume contains itineraries of the Mexican railways, arranged for the most part in a geographical order. The numbers of the Sections in which the various routes are dealt with in the Appendix are given in the third column of the annexed table, in which the lines of the principal systems are grouped together, the old names of these systems being retained for convenience both here and in the itineraries, so far as they remain in common use. The fourth column in the table shows the principal branches and connexions with the main lines, and indicates their titles when these are known as distinct from those of the main lines. In the itineraries in Appendix III, references will be found to a large number of other light railways for mining, agricultural, and other purposes, connecting with the main routes. The small lines and tramways in Lower California are referred to in Section XXXIII, those in Tabasco State in Section XXXV, and those in Quintana Roo in Section XXXII (*g*), all these being unconnected with any main system. Railways worked by oil companies in northern Vera Cruz, but unconnected with main lines, are not included in the Appendix, but are referred to on p. 137.

The information available has been less complete for some lines than for others, and in view of the general condition of the lines indicated elsewhere in this section, it is necessary to reiterate that the details given must be used with caution.

<i>Title of Railway.</i>	<i>Route.</i>	<i>Section in App. III.</i>	<i>Principal Branches and Connections.</i>
Southern Pacific (<i>F.C. Sud-Pacifico de Mexico</i>)	Nogales - Magdalena - Hermosillo - Guaymas - Culiacan - Mazatlan - Tepic; and La Quemada-Orendain	I	Lomas-Del Rio; Torres-Minas Prietas and beyond (Mexican Union Rly., <i>F.C. Mexicano de Union</i>); Corral - Tonche; Navjoa - Alamos; Culiacan - Altata (<i>F.C. Occidental</i>); Quila-El Dorado.
Nacozari Kansas City, Mexico, and Orient	Naco-Cananea Agua Prieta-Nacozari Marquez - Chihuahua - Sanchez; and Los Hornillos-Topolobampo	II III IV	San Antonio-Cosihuiriachic.
North-Western (<i>F.C. Nor-Oeste de Mexico</i>)	Ciudad Juarez - Guzman - Chihuahua	V	Chihuahua - Santa Eulalia (Chihuahua Mining Co.); Chihuahua-Santa Eulalia (<i>F.C. Mineral de Chihuahua</i>).
Mexican Central (National System)	Ciudad Juarez - Chihuahua - Santa Rosalia - Jimenez - Gomez Palacio - Torreon - Zacatecas-Aguascalientes - Lagos - Leon - Silao - Irapuato - Salamanca - Celaya - Queretaro - San Juan del Rio-Mexico City	VI	Santa Rosalia-Boquilla (<i>F.C. Camargo y Oeste</i>); Jimenez - Parral - Rosario; Parral - Minas Nuevas, and Minas Nuevas - Paraje Seco (<i>F.C. de Parral y Durango</i>); Escalon-Sierra Mojada (<i>F.C. Mexicano del Norte</i>); Conejos - Descubridora (<i>F.C. Central de Durango</i>); Bermejillo - Mapimi (<i>F.C. de Mapimi</i>); Brittingham - Dinamita; Zacatecas - Trancoso (<i>F.C. Compañia Constructora Nacional Mexicana</i>); Rincon de Romos-Cobre; Aguascalientes-San Luis Potosi; Silao-Guanajuato; San Juan de la Vega (Gonzalez Junction, Section VII)-Salamanca-Valle de Santiago-Jaral del Valle; Cazadero-Nado (<i>F.C. Cazadero á Solis</i>); Tula-Pachuca.
	San Luis Potosi - Valles - Tampico	VII a	San Bartolo-Rio Verde.

Montercy - Linares - Ciudad Victoria-Tampico	IX	Linares-San José.
Tampico-La Barra	IX ^a	
Mexico City-Telles-Pachuca	XIII (A)	
Mexico City-Tacubaya-Cuernavaca-Puerto de Ixtlahuaca-Balsas	XXII	
Guadalajara - Zapotlan - Colima-Manzanilla	XXVIII	
Irapuato - La Piedad - Orendain-San Marcos	XXIX	Penjamo - Zacapu, &c.; Yurecuaro - Zamora-Los Reyes; Ocotlan-Atotonilco; El Castillo-Juanacatlan (<i>F.C. Juanacatlan</i>); La Vega-Ameca.
Laredo (Nuevo) - Monterey - Saltillo - Vanegas - Catorce - San Luis Potosi-Dolores Hidalgo-San Miguel de Allende - Gonzalez Junction - Queretaro-Mexico City	VII	Monterey-Camargo-Matamoros; Saltillo-Concepcion del Oro (<i>F.C. de Coahuila y Zacatecas</i>); Avalos-San Pedro de Ocampo (<i>the same</i>); Saltillo-Parras-Torreón (<i>F.C. Coahuila y Pacifico</i>); Alamito-Hornos (<i>F.C. de Hornos</i>); Hornos-San Pedro de la Laguna; Vanegas-Matehuala; Matehuala-Dolores (<i>F.C. de Matehuala</i>); San Luis Potosi-Ahuacatal (<i>F.C. Potosi y Rio Verde</i>); Rincon-San Luis de la Paz-San Pedro de los Pozos; Tlalnepantla-Progreso Industrial (<i>F.C. Monte Alto y Tlalnepantla</i>).
Gonzalez Junction - Celaya-Acambaro-Toluca - Mexico City	XI	Acambaro (Guadalupe)-Jerecuaro (<i>F.C. Acambaro á Queretaro</i>); Maravatio-Zitacuaro; Zitacuaro-Joconusco (<i>F.C. Zitacuaro á Joconusco</i>); Tultenango-El Oro-Yondese (<i>F.C. Minero de El Oro</i>); Ixtlahuaca-Presa Grande (<i>F.C. de Ixtlahuaca</i>); Toluca-Tenango (<i>F.C. Toluca á Tenango y San Juan</i>); Tenango-Alta (<i>F.C. Tenango á Santa Maria</i>); Toluca-San Juan de las Huertas (<i>F.C. T. á T. y S.J.</i>).

National (*F.Cs. Nacionales de Mexico*)

F.C. = *Ferro-carril* (railway).

<i>Title of Railway.</i>	<i>Route.</i>	<i>Section in App. III.</i>	<i>Principal Branches and Connections.</i>
	Acambaro - Morelia - Patzcuaro-Uruapan	XII	
<i>F.C. Hidalgo y Nordeste</i> (National system)	Teles-Tulancingo-Honey Mexico City-Tepa-Pachuca	XV XIII (B)	Tepenasasco-Apulco. Gran Canal-San Cristobal-El Tajo de Tequisquiatic (<i>F.C. del Desagüe del Valle de Mexico</i>); Tepa-San Augustin-Irolo-San Lorenzo.
	Tepa - Beristain - Huauchinango	XIV	Ventoquipa-Tortugas.
Mexican International (National System)	Piedras Negras - Allende - Sabinas - Monclova - Torreon - Durango - Tepehuanes	VIII	Allende - Esmeralda; Sabinas - Rosita, Hondo, and La Purisima; Barroteran-Las Esperanzas-Santa Rosa de Muzquiz (<i>F.C. Carbonifero de Coahuila</i>); Monclova - Il Cuatro Cienagas; Reata-Saltillo; Reata-Monterey; Torreon-Tlahualilo; Durango-Mena-Cañitas.
Tampico-Panuco Valley <i>F.C. Pachuca á Tampico</i> Interoceanic (National system)	Tampico-Topila and beyond Pachuca-Ixmiquilpan Vera Cruz-Jalapa-Oriental-Los Reyes-Mexico City	IX b X XVI	Santa Fé-San Antonio; Jalapa-Teocelo (<i>F.C. Jalapa á Teocelo</i>); Oriental-Teziutlan (Mexican Eastern Rly.); Oriental-Libres-Concepcion. Tlaloc-Huejotzingo.
	Oriental-San Marcos-Puebla-San Lorenzo	XVII	
	Puebla - Cholula - Atlixco - Cuautla	XVIII	Puebla-Huejotzingo and El Valor (<i>F.C. Industrial de Puebla</i>); Atlixco-Santa Catalina (<i>F.C. San Rafael y Atlixco</i>); Atencingo-Tlalcuapalcan.
	Cuautla - Amecameca - Los Reyes	XIX	
	Cuautla-Puente de Ixtla	XX	

Mexican Southern (operated by Inter-oceanic : National system)	Puebla - Rosendo Marquez - Tehuacan - Tonellin - Oaxaca	XXVII	Tehuacan - Esperanza ; Oaxaca - Ocotlaa - Ejutla (<i>F.C. de Oaxaca á Ejutla</i>) ; Oaxaca - Tule - Tlacolula ; Oaxaca - Taviche ; Oaxaca - Ayoquezco (<i>F.C. Agrícola de Oaxaca</i>).
<i>F.C. San Rafael y Atlixco</i>	Mexico City - Amecameca - Ozumba ; and Atlántida - Apasasco	XXI	
Mexican (<i>F.C. Mexicano</i>)	Vera Cruz-Cordoba-Orizaba-Nogales - San Andres - San Marcos - Apizaco - Muñoz - Soltepec-Irolo-Mexico City	XXIII	Cordoba-Coscomatepec (<i>F.C. de Cordoba á Huatusco</i>) ; Esperanza-Xuchil ; San Andres - Chalchicomula (<i>F.C. de Chalchicomula á San Andres</i>) ; San Marcos - Rosendo Marquez-Mucio Martinez (<i>F.C. de San Marcos á Huajuapán de Leon</i>) ; Apizaco-Tlaxco (<i>F.C. Agrícola de Tlaxco</i>) ; Apizaco-Santa Ana ; Muñoz-Chignahuapan ; Irolo-Tepa-Pachuca ; Ometusco-Tepa-Pachuca.
Vera Cruz . Vera Cruz and Isthmus (<i>F.C. Vera Cruz al Istmo</i> : National system)	Vera Cruz-Alvarado Vera Cruz - Tierra Blanca - Santa Lucrecia	XXIV XXV	Tres Valles-San Cristobal ; El Burro-San Andres Tuxtla.
Tehuantepec National (<i>F.C. Nacional de Tehuantepec</i>)	Cordoba-Tierra Blanca Puerto Mexico - Santa Lucrecia - Rincon Antonio - Gamboa - Tehuantepec - Salina Cruz	XXVI XXX	Carmen-Minatitlan (<i>F.C. Minatitlan</i>) ; El Juile-San Juan Evangelista.
Pan-American (National system)	Gamboa-Tonala-Suchiate	XXXI	
United Railways of Yucatan (<i>F.C. Unidos de Yucatan</i>)	Various lines in Yucatan and Campeche <i>F.C. = Ferro-carriil (railway).</i>	XXXII	

External Connexions

Mexico is entered at twenty different points affording communication with through railway routes. Of these, seven are by way of the land frontiers and thirteen are through seaports. In addition there are certain railways in the north and others from the coasts that are not connected with the capital.

Routes across Land Frontiers.—The routes by the northern land frontier are as follows (the numbers referring to Sections in Appendix III): via (a) Nogales, Sonora, the terminus of the lines from Tucson and Benson, Arizona, by way of the Southern Pacific lines to Tepic, whence through communication has not yet been established with Mexico City (Section I); (b) Naco, Sonora, and the same route (Section II); (c) El Paso, Texas, and Ciudad Juarez, Chihuahua, either by the Mexican Central Railway direct to Chihuahua and Mexico City or by way of the Mexico North-Western Railway to Chihuahua (Sections VI and V); (d) Marquez, Chihuahua, the present northern terminus of the Kansas City, Mexico, and Orient Railway, which has not yet been constructed to the frontier, and thence over that line, through Chihuahua, to its present western terminus at Sanchez (Section IV); (e) Eagle Pass, Texas, and Piedras Negras, Coahuila, and thence via the International Railway to Reata and Monterey (Section VIII); (f) Laredo, Texas, and Nuevo Laredo, Coahuila, and thence by the National Railway to Monterey and Mexico City (Section VII); (g) Brownsville, Texas, and Matamoros, Tamaulipas, and thence by the National Railway to Monterey (Section VII). In addition the northern frontier is crossed by the Southern Pacific Railway at Mexicali, Lower California, and at Agua Prieta, Sonora, by the Nacozari Railway; but these two lines do not afford any through routes (Sections XXXIII and III).

In the south there is connexion by means of the Pan-American Railway across the frontier of Guatemala (Section

XXXI), but through communication does not appear to be worked.

Routes from the Atlantic Coast.—On the east coast there is railway communication from (a) Tampico to Monterey and San Luis Potosi respectively (Sections IX and VII); (b) Vera Cruz, by way of the Interoceanic Railway and Mexican Railway to Mexico City (Sections XVI and XXIII); (c) Alvarado, by the line to Vera Cruz (Section XXIV); and (d) Puerto Mexico by the Tehuantepec Railway (Section XXX). There are also railways from Campeche, State of Campeche, and Progreso, in Yucatan; and there are the small lines in Quintana Roo (Section XXXII); but there is no through communication with Mexico City.

Routes from the Pacific Coast.—On the west coast there is communication from (e) Guaymas, Sonora, by the Southern Pacific Railway (Section I); (f) Topolobampo, Sinaloa, by the Kansas City, Mexico, and Orient Railway (Section IV); (g) Altala, (h) El Dorado, and (i) Mazatlan, Sinaloa, by the Southern Pacific Railway; (j) Manzanilla, by the Mexican Central to Guadalajara and Mexico City (Section XXVIII); (k) Salina Cruz, Oaxaca, and the Tehuantepec Railway (Section XXX); (l) Puerto Arista, Chiapas, and the Pan-American Railway, and (m) San Benito, Chiapas, a small port near to the same railway (Section XXXI).

Damage to Railways and Rolling Stock

During the revolutionary disturbances of the past few years (from 1911 onward) the railways have been greatly damaged. This more particularly applies to the lines passing through Chihuahua, Coahuila, and Tamaulipas, where the destruction of bridges, permanent way, and rolling stock has been systematic and persistent. In other portions of the Republic much destruction has been done, and a large part of the system requires heavy repair work before normal conditions can be re-established.

At the end of 1916 the position was substantially as follows :

It was then estimated that more than 20,000 cars had been destroyed and 500 locomotives rendered useless. In addition several hundred locomotives were under repair in the various shops. The lines between Laredo and Torreon were being operated by the Peñoles Mining Co. with its own engines, and the Oliver Transportation Co. was running trains from Piedras Negras to the city of Mexico. The line from San Luis Potosi to Tampico was in the hands of bandits, as well as the International, and the lines from Torreon to Chihuahua and Torreon to Zacatecas. From San Luis Potosi to Aguascalientes the track was in good condition, and also thence to Mexico City and the section to Guadalajara. From Guadalajara to Manzanilla the line was in bad condition, and the Cuernavaca division was then out of commission except for military trains. The Mexican Railway was in fair condition, though the equipment was very bad, but the Interoceanic Railway was severely damaged, and four-fifths of the cars and engines were destroyed. From Puebla to Oaxaca the track and bridges were in fair condition, but the equipment had been nearly all destroyed. The Southern Pacific was running through trains to Tepic over a track in good condition, except that numerous bridges had been destroyed and hastily repaired. The Tehuantepec Railway had not been seriously affected.

By the end of 1917 these conditions had been improved, and it was reported that a considerable amount of repair work had been done, and that nearly 12,000 miles of railways were then in use. Nevertheless, so late as Nov. 1917 a train was dynamited on the Mexican Central at Armentariz, 50 miles south of Chihuahua, and many passengers were killed. In June, 1918, the line between Cordoba and Tierra Blanca was reported to be closed, and after that date the service on the Tehuantepec line was still unreliable owing to unsettled conditions. Military protection was necessary everywhere.

It is impossible to give any satisfactory estimate of the amount of rolling stock still in existence in Mexico as a whole. The official and non-official figures by no means correspond.

It has been officially stated¹ that the National Railways possessed on June 30, 1913, the following equipment as against that held by the so-called Constitutionalist Railways on June 30, 1916 :

	1913.	1916.
Standard gauge passenger coaches	435	414
Narrow gauge passenger coaches	118	101
Standard gauge freight cars	16,661	13,222
Narrow gauge freight cars	1,831	1,397
Standard gauge locomotives	635	596
Narrow gauge locomotives	94	83

The above figures, however, must be accepted with great reserve. Moreover, the stock of the Constitutionalist Railways has been augmented by equipment seized from other lines, notably the Mexican Railway and the Tehuantepec Railway, and by stock purchased in the United States. The position with regard to the National Railways was given as follows on Jan. 15, 1916 :²

	June 30, 1914	End of 1915
Standard gauge cars	15,700	3,775
Narrow gauge cars	3,267	1,925
Locomotives	762	490 (and 160 in repair shops)

With regard to bridges the position was officially estimated as follows (June 30, 1914). In the sections belonging to the National Railways (not the Constitutionalist Railways as a whole) 35,952 ft. of bridges had been destroyed, and the cost of reconstruction was stated to be 8,558,048 Mexican silver pesos. The greatest damage was in the Chihuahua, Pan-American, San Luis Potosi, Mexican Southern, and Monclova divisions, in the order mentioned, where the estimates were 1,405,000, 1,392,000, 845,000, 765,000, and 504,000 pesos respectively. In the two first divisions the destruction had been facilitated by the large number of wooden bridges on the track. At the

¹ Eighth Annual Report of the National Railways for the year ended June 30, 1916.

² *Railway Review*, January 15, 1916.

same time the cost of repairs to the track was computed at 27,393,617 pesos, the most extensive damage being in the Mexico-Queretaro and Interoceanic divisions. The cost of repairing buildings was stated to be 3,922,000 pesos.

Working Expenses

With respect to the expense of operating the railways during normal times, the following comparison between the railways of Mexico and of the United States affords indications of Mexican conditions (1907), the figures representing percentages of the total working expenses :

	<i>Mexico.</i>	<i>Pacific roads (U.S.).</i>	<i>All U.S. roads.</i>
Locomotive expenses :			
Fuel	26.3	11.0	7.6
Water	1.3	0.6	0.4
Oil and waste	0.8	0.8	0.8
Repairs	7.4	8.0	9.2
	<hr/> 35.8	<hr/> 20.4	<hr/> 18.0
Car Expenses	10.0	11.1	12.5
Wages account	15.2	20.5	16.5
Track expenses	12.5	17.5	15.0
Miscellaneous	26.5	30.5	38.0
	<hr/> 100	<hr/> 100	<hr/> 100

It will be seen that locomotive expenses in Mexico were exceedingly heavy owing to the scarcity of coal. Since that date oil has been used extensively, and locomotive expenses have been much reduced. Another factor to be noted is the high cost of water, indicating the fact that long stretches of line cross arid areas, and on certain sections it becomes necessary to haul water in tanks.

Railway Operation

A comparison of four Mexican lines with the United States railways, made about the same date, affords interesting details in other respects :

	<i>Mexican.</i>	<i>National.</i>	<i>Inter- national.</i>	<i>Central.</i>	<i>U.S.</i>
Average haul, freight miles	116	165	210	237	—
Train load in tons . . .	93	240	202	282	335
Employees per mile . . .	—	343	273	407	637
Per cent. of Mexicans . . .	—	93·3	77·8	88·3	—

With respect to freight traffic the following particulars illustrate the respective percentages on different railways :

	<i>Mexican.</i>	<i>National.</i>	<i>Inter- national.</i>	<i>Central.</i>
Forest products	5·2	11·0	16·0	6·1
Agricultural products	41·5	21·9	22·4	11·0
Animal products	1·9	3·8	2·9	2·1
Mineral products	26·3	54·0	46·3	75·5
Manufacturing products	25·1	9·3	12·4	5·3

The Central, National, and International railways, especially the last, rely to a considerable extent upon mineral traffic, whilst the Mexican (and also the Interoceanic) are mainly dependent upon agricultural products and manufactured goods.

During 1917 a certain amount of railway construction was undertaken. There are numerous railway concessions in existence, and many others have been granted but have lapsed.

As already stated, the information given in Appendix III is subject to correction. Many changes have been made during recent years with respect to grades, curves, tunnels, bridges, and location, in addition to the damage caused by revolutionary excesses.

The position (on June 30, 1916) resulting from these disturbances, is illustrated by a comparison between the trains run on the National Railways on June 30, 1914, and those operated on the same day two years later : ¹

¹ It must be noted that the number of trains given is in excess of those actually run, as many run in more than one division.

<i>Division.</i>	<i>National Railways.</i>			<i>Constitutionalist Railways.</i>			<i>Difference.</i>
	<i>Passenger.</i>	<i>Freight.</i>	<i>Mixed.</i>	<i>Passenger.</i>	<i>Freight.</i>	<i>Mixed.</i>	
Mexico-Queretaro .	26	19	4	8	9	10	-22
Aguascalientes .	18	8	6	6	4	8	-14
Torreón .	6	6	6	2	0	2	-14
Chihuahua .	6	8	6	2	2	0	-16
Monterey-Gulf .	6	6	0	6	0	0	6
San Luis .	10	22	2	6	6	6	-16
Northern .	8	8	2	4	0	6	-8
Mondlova .	6	12	12	6	4	6	-14
Durango .	2	4	13	2	0	6	-11
Cardenas .	6	18	2	0	33	8	+15
Guadalajara .	10	8	8	6	4	10	6
Pacific .	8	12	4	6	4	4	-10
Hidalgo .	4	4	16	4	4	14	2
Vera Cruz-Isthmus .	0	6	14	0	0	10	-10
	116	141	95	58	70	90	-134
			352			218	

Administrative Divisions of National Railways

The administrative divisions of the National Railways are as follows ;

<i>Grand Divisions.</i>	<i>Divisions.</i>	<i>Miles.</i>	<i>Limits.</i>
Northern	Chihuahua . . .	473·8	Juarez—Jimenez—Rosario : Adrian—Santa Barbara.
	Torreon . . .	402·5	Jimenez—La Colorada : Tlahualilo : Dinamita : Hipolito.
	Monclova . . .	489·6	Sanceda—Piedras Negras : Reata—Monterey : Anheloparedon.
	Saltillo . . .	275·2	Torreon — Saltillo — Paredon — Hipolito.
	Northern . . .	439·2	Saltillo—Laredo: Monterey—Matamoros.
	Monterey and Gulf Durango . . .	368·7 296·6	Hipolito—Monterey—Tampico. Durango—Torreon—Mena—Veladerna—Llano Grande.
Central	San Luis . . .	452·1	Saltillo—Gonzalez—Matehuala—Potrero—Pozos.
	Aguascalientes . . .	454·8	La Colorada—Irapuato : San Luis : Ojo Caliente : Cobre : Guanajuato.
	Cardenas . . .	301·2	San Luis—Tampico : Rio Verde
	Mexico-Queretaro . . .	856·1	Irapuato—Gonzalez—Balsas : Mexico—Pachuca — Tellez — Honey — Tepenacasco : San Juan de la Vega—Jalisco.
	Guadalajara . . .	658·2	Irapuato — Guadalajara : La Junta—Campos: San Marcos : Ameca : Ajuno : Los Reyes—Atotonilco.
	Pacific . . .	402·1	Gonzalez—Uruapan : Mexico—Acambaro: Maravatio—Zitacuaro—Angangueo.
Southern	Tampico Terminal . . .	6·2	Tampico—La Barra.
	Manzanilla Terminal . . .	3·2	Campos : Manzanilla.
	Hidalgo . . .	156·8	Mexico—Beristain Irolo—Pachuca—Ventoquipa—Cepulco.
	Isthmus . . .	340·3	Cordoba—Santa Lucrecia—Vera Cruz — Cosamaloapan — San Andres Tuxtla—Cerro Colorado.
	Pan-American . . .	284·6	Picacho—Suchiate.
	Mexico Terminal . . .	26·3	Tacuba—Buenavista—San Lazaro—Xico — Fabricas — Nozalco—Colonia.
Total . . .		6687·5	

TRAMWAYS

Tramways, either with electric or with animal traction, are extensively used in Mexico, not only in many towns, but also in rural and mining districts. In the *Gazetteer of Towns*, Appendix I, reference is made to tramways in the towns so far as information is available. In the itineraries in Appendix III, reference will be found to numerous tramways connecting with the main railway routes. The extensive system of electric and other tramways radiating from Mexico City are dealt with in Section XXXIV of that appendix, and those in Tabasco State, which are not connected with the railway system, in Section XXXV. Among recent tramway schemes, there is one to connect Vera Cruz, Cordoba, and Orizaba by an electric line ; this is reported (1917) to be partly built, but worked at present with animal traction.

TELEGRAPHS ¹

Cables.—On the Gulf Coast cables run (a) from Vera Cruz to Galveston, (b) from Campeche to Frontera, Puerto Mexico, Vera Cruz, and Tampico. The Vera Cruz–Puerto Mexico lines belong to the Central and South American Telegraph Co., and the Galveston lines to the Mexican Telegraph Co., both American companies.

On the Pacific Coast cables run (a) from Salina Cruz to San José, Guatemala, and coast stations beyond, (b) from Salina Cruz to San Juan del Sur, Nicaragua, and coast stations beyond (Central and South American Telegraph Co.) See map¹.

Land Telegraphs.—There is a fairly extensive system (in addition to railway telegraphs), mainly federal, but in some parts maintained by individual States. It is illustrated in the map,¹ which is based mainly on information of 1907, with additions of later date where possible.

Wireless Telegraphy.—The following stations are given in the *Yearbook of Wireless Telegraphy* :

¹ Map of telegraphs in case accompanying this volume.

<i>Name.</i>	<i>Call Signal.</i>	<i>Normal Range in Nautical Miles.</i>	<i>Normal Wave-length in Metres.</i>	<i>Hours of Service.</i>
(a) <i>Gulf Coast</i>				
Payo Obispo *	XAC	300	1,180	8 a.m. to 10 p.m.
Campeche *	XAB	300	900	" "
Vera Cruz *	XAA	300	900	" "
Tuxpan	XAI	320	900	" "
(b) <i>Pacific Coast</i>				
Isla Maria Madre	XAD	300	900	8 a.m. to 7 p.m.
Mazatlan *	XA E	180	900	" "
Guaymas *	XAH	300	900	" "
Santa Rosalia	XAG	80	600	" "
San Jose del Cabo	XAF	180	900	" "

Stations marked with an asterisk (*) transmit the time of the meridian of Tacubaya (see p. 41) daily at noon. From 11.55 a.m. to noon the inquiry signal CQ is repeated, followed by the signal XH; at noon the word 'noon' is transmitted, followed by an announcement of the state of the weather.

There are other wireless stations in Mexico, considerable activity in this direction having taken place in recent years, but there is less definite information about these. In 1916 it was reported that there were 14 stations in all, and in and since that year, in addition to the stations named above, plants are mentioned at Mexico City (suburb of Chapultepec, a high-power installation with a range of 1,550 miles), Alamos, Acapulco, Cuernavaca, Oaxaca, Chihuahua, and Guadalajara (reported in construction), while there are also stations at Xcalak, Merida (receiving only), Salina Cruz, probably Tampico, and Pungarabato (Guerrero) and possibly elsewhere.

POSTAL ARRANGEMENTS

Under the central administration of the General Post Office in Mexico City, postal business is carried on in the following offices, which in all numbered 2,911 in 1913.

(a) Local Administration and Branch Offices, which deal with the usual business of letters, parcels, &c., ordinary and registered, and furnish or cash postal orders for nearly all countries (excepting Spain).

These offices, to expedite the receipt of mail, the cashing of

money orders, &c., issue identification cards for a small fee, on presentation, by the applicant, of proof of identity and his photograph.

For home service, a system of cash on delivery for goods sent by parcel post is in force, payment being forwarded by postal order. Orders to and from the United States are issued (1913) as for home service at a fixed rate of exchange for 2 pesos per U.S. dollar. A similar arrangement exists with Japan.

(b) Local Postal Agencies, in small places, which deal only with ordinary and registered letters, and parcels up to 2 kilogrammes in weight, for the home and U.S. service. Postal orders and parcels c. o. d. are not dealt with.

(c) Travelling post offices on railway trains, for the sale of stamps and ordinary mail service.

The ordinary postage on letters not exceeding 20 grammes in weight is: for urban or suburban service, 2 centavos; to other points in Mexico, and to the United States, Canada, and Cuba, 5 centavos; to other countries, 10 centavos. Maximum weight, 5 kilogrammes (11 lb.). Postcard rates are 1, 2, and 4 centavos respectively. There are special rates for printed matter and business documents.

The parcel post rate, within Mexico, is 12 centavos for 500 grammes ($1\frac{1}{10}$ lb.): maximum weight, 5 kilogrammes (11 lb.). Parcels for outside Mexico are commonly detained for several days by the Customs authorities at the port of entry.

The following abbreviations of the names of States and territories are used for postal and other purposes:—

Aguascalientes	Ag.	Jalisco	Jal.	Quintana Roo	Q.R.
Campeche	Cam.	Lower (Baja)		San Luis Potosi	S.L.P.
Chiapas	Chis.	California	B. Cfa.	Sinaloa	Sin.
Chihuahua	Chih.	Mexico	Mex.	Sonora	Son.
Coahuila	Coah.	Michoacan	Mich.	Tabasco	Tab.
Colima	Col.	Morelos	Mor.	Tamaulipas	Tam.
Durango	Dgo.	Nayarit	(?)		(Tamps.)
Federal District	D. F.	Nuevo Leon	N. L.	Tlaxcala	Tlax.
Guanajuato	Gto.	Oaxaca	Oax.	Vera Cruz	Ver.
Guerrero	Gro.	Puebla	Pue	Yucatan	Yuc.
Hidalgo	Hgo.	Queretaro	Qro.	Zacatecas	Zac.

STEAMSHIP LINES

The chief shipping lines serving Mexican ports are given below. The list is based on the sailings in 1914 with certain additions. Lines confined to oil-carrying are not included. The disturbed state of Mexico has resulted in the withdrawal of the vessels of several lines serving Pacific ports. This applies especially to the Pacific Coast Steamship Co. and the Northern Pacific Steamship Co., both of San Francisco, which are in consequence omitted from the list. The opening of the Panama Canal has probably altered some of these routes.

Mexican lines—

Compañía Mexicana de Navegación : all Mexican Atlantic ports as far east as Progreso.

Compañía Naviera del Pacifico : all Guatemalan and Mexican Pacific ports and San Diego (see p. 148).

Compañía de Navegación Sud-Pacifico : Manzanilla to Mazatlan.

British lines—

Harrison and Leyland Line : Puerto Mexico, Vera Cruz, and Tampico.

Royal Mail Steam Packet Co. : Puerto Mexico, Vera Cruz, and Tampico, via Havana.

Elder Dempster Co. : Montreal or Halifax to Tampico, Vera Cruz, and Puerto Mexico.

Cuban Steamship Co. : Vera Cruz, Tampico, and Puerto Mexico, and Progreso.

Canadian-Mexican Pacific Steamship Line : Victoria, B.C., to Mexican Pacific ports.

Pacific Steam Navigation Co. : Guatemalan and Nicaraguan ports to Salina Cruz (vessels formerly owned by Salvador Railway Co.).

United States lines—

American Hawaiian Steamship Co. : New York and Philadelphia to Puerto Mexico ; Salina Cruz to Honolulu. (Some if not all the vessels of this company now go by the Panama Canal.)

Wolvin Line : New Orleans to Tampico, Vera Cruz, and Puerto Mexico.

Munsen Steamship Line : New York, Galveston, and Tampico.

Ward Line (New York and Cuba Mail Steamship Co.) : New York via Havana to Progreso, Vera Cruz, and Tampico.

Caribbean and Southern Steamship Co. : New Orleans to Progreso.

Gulf Coast Fruit and Steamship Co. : Galveston to Tampico, Vera Cruz, and Puerto Mexico.

Pacific Mail Steamship Co. : San Francisco to Mexican Pacific ports and Central America. (Some ports of call abandoned owing to disturbed state of country.)

Atlantic and Mexican Gulf Steamship Co. : Mobile to Vera Cruz, Puerto Mexico, and Progreso.

American Mexican Steamship and Trading Co. : San Francisco to Mexican Pacific ports (started 1915).

Gulf Mail Steamship Co. : San Francisco to all Pacific Mexican ports as far south as Salina Cruz.

French line—

Compagnie Générale Transatlantique : Vera Cruz and Puerto Mexico, via Havana.

German lines—

Hamburg-Amerika line : Tampico, Vera Cruz, and Puerto Mexico.

Kosmos line : Hamburg and Pacific ports to San Francisco.

Roland line : Hamburg and Pacific ports.

Jebsen line : Pacific ports.

Ocean Steamship Co. : Tampico and other Gulf ports.

Spanish line—

Compañía Transatlántica de Barcelona : via Havana to Vera Cruz and Puerto Mexico.

Norwegian line—

Norge Mexico Gulf Line : Christiania to Vera Cruz, Tampico, and Puerto Mexico.

Swedish lines—

Johnson line (Rederiaktiebolaget Nordstjernan) : Göteborg

via the Panama canal to Mexican Pacific ports and San Francisco.

Amerika-Mexiko line : Göteborg to Gulf ports via New York and New Orleans.

Japanese line—

Toyo Kisen Kaisha : Japanese ports to Honolulu, San Francisco, Manzanilla and Salina Cruz.

Dutch line—

Holland-Amerika line : Rotterdam, Tampico, &c.

The establishment of several new lines has been reported during 1914–18, but information is lacking as to whether they are now sailing. In 1914 the *Compañía Peruana de Vapores y Dique del Callao* was to establish a line between Callao and Salina Cruz with vessels of 4,000 tons. In 1915 two United States companies, the California South-Sea Navigation Co. and the South-Western Steamship Co. were planning to run boats from San Francisco to ports as far south as Panama.

COASTLINE, HARBOURS, AND ANCHORAGES

Atlantic Coast

Quintana Roo.—On the east coast of Yucatan Peninsula, Mexican territory terminates at Bahia Chetumal. This inlet, almost wholly surrounded by low, swampy, and densely wooded country, is shallow all over, and has channels with 8 to 12 ft. depth leading to the mouths of the rivers entering it. Of these the chief is the Hondo, at the mouth of which is the Mexican settlement of Payo Obispo, opposite that of Consejo in British Honduras.

Payo Obispo is a collection of thatched huts with a few larger timber houses, a population of about 3,000, and a trade in timber, logwood, and chicle. It is accessible only by small coasting vessels.

About 5 miles north of the entrance to Bahia Chetumal, called Boca Bacalar Chico, is Xcalak, a small port of call for local shipping, where vessels anchor offshore in deep water.

There have been plans for an artificial harbour here, but the work does not appear to have been carried far.

The coast of Quintana Roo between Xcalak and Bahia del Espiritu Santo is low and flat, with mangrove swamps and sandy beaches backed by coco-nut palms, and is almost all fronted by a reef 1 to 1½ mile off shore, with difficult channels through it, the passage of which requires local knowledge. About 14 miles off a considerable section of this coast lies the Banco Chinchorro.

The adjacent inlets of Bahia del Espiritu Santo and Bahia de la Ascension are both ports of entry, but of little importance. The former is entered between reefs, and affords anchorage inside these but outside the bar, which has only 6 ft. of water. Bahia de la Ascension similarly has anchorages for vessels of moderate draught inside the outlying reefs, but within the entrances (of which there are two) there are shallow bars. There is anchorage inside the bay at Vigia Chico, whence there is a light railway to Santa Cruz de Bravo (see p. 507).

The coast northward of these inlets is of similar character, except at Peñasco Ynan or Kilbride cliffs, about 26 miles northward of Bahia de la Ascension, which extend for 3 miles and are some 80 ft. high. Beyond them the low coast is resumed, with broken reefs off it and a canoe channel within.

The low flat island of Cozumel, north-eastward of Peñasco Ynan, lies parallel to the coast and about 10 miles off it; the principal settlement on the island is San Miguel, on the west coast, off which there is good anchorage in 5 or 6 fathoms.

About 20 miles northward of San Miguel, on the mainland, is Puerto Morelos, on a small reef harbour, with depths of 22 to 33 ft., and two small wharves. A company has developed the chicle trade here.

North of Puerto Morelos the character of the coast changes. The water is shallower immediately off it; there are islands (Cancun, Mugeris, Blanca, Contoi), and the shelf from which they rise represents a southward extension of the Banco Campeche (see Chap. I, *Coasts*). The coast of the mainland

continues low and sandy. There are a few fishermen's huts along it, and on the mainland behind Cancun Island is the Colonia San Jose Tabasco, but the only settlement of any importance is that of Dolores on Mugeris Island, where fishing, sponge-gathering, and turtle-catching are carried on. Puerto Mugeris, an anchorage between the island and the mainland, has depths of 24 to 29 ft.

Yucatan.—Cabo Catoche, marking the north-easternmost extension of Yucatan Peninsula, is on Jolbos or Holbox, one of several islands which fringe the north coast of the peninsula for about 20 miles, and enclose the shallow lagoon of Yalahan. Westward of this there are no more islands or reefs, the coast consisting almost entirely of a narrow strip of low sand-dunes, with very shallow water for a long distance off shore. From the north-west end of Yalahan lagoon a continuous or practically continuous channel (probably a chain of lagoons and marshes, and of no value for communication), extends parallel with the outer shore-line along the whole length of the north coast of the peninsula. The north coast of the peninsula is drier than the east, and by no means so heavily wooded. There are a number of settlements along the outer dunes, all small and unimportant excepting the port of Progreso,¹ upon which centres almost all the export and import trade of Yucatan. It has only an open, shallow roadstead.

Along the whole of this coast large vessels have to lie several miles off shore in usually indifferent anchorages exposed to Northerers.

The small port of Sisal, 29 miles westward of Progreso, has lost its importance to Progreso: it was formerly the port for the export of hemp from Yucatan, to which it gave its name. Its position is similar to that of Progreso, with a marshy lagoon behind it.

From Punta Palmas, 23 miles beyond Sisal, the coast of the peninsula turns southward, but its character is unchanged. Ten miles further on is Celestun, a village with a trade in salt

¹ See Appendix I, *Gazetteer of Towns*.

from a lagoon which marks the end of the north-coast chain of lagoons and marshes described above.

Campeche.—The low coast now becomes swampy and mangrove-covered for nearly 30 miles, after which it is firmer to Campeche town, but the sea off shore is so shallow that even light-draught vessels do not sight the coast. About 8 miles from Campeche, however, appears the first elevated land seen on this side of the peninsula ; it rises 180 to 200 ft., and the decayed port of Campeche¹ is backed by low hills. This port, again, is on a shallow open roadstead, but the anchorage is fairly safe and less subject to Northers than most of the Gulf ports.

Beyond Campeche, for some 40 miles, as far as Champoton, the coast, though fronted as usual by a sandy beach, is somewhat bolder and more approachable, low hills continuing behind it.

The small town of Champoton is at the mouth of a river of the same name, the first of the Gulf Coast rivers to be reached in this direction which are navigable inland : the Champoton carries some trade in timber and chicle in flat-bottomed boats.

The coast beyond Champoton is low, featureless, and backed by low country for nearly 60 miles, past Sabancuy with its lagoon, to the Laguna de Terminos. This lagoon is about 40 miles long from north-east to south-west, and 17 in extreme width, shallow nearly all over, with low, swampy, and forested shores. It abounds in alligators and fish. It is entered by Puerto Real in the east and Barra Principal in the west, between which it is fronted by Carmen Island, low and sparsely covered with trees, with a sandy beach on the seaward side. At its western end, on Barra Principal, is the port of Carmen,¹ inaccessible by vessels drawing over 13 ft. The rivers entering the lagoon afford the principal means of communication inland from Carmen (see Chap. II, *Rivers*), and the Rio Palizada appears to be regularly used by steamers of the Linea Testamentaria de P. Valenzuela, which serve the town of Palizada (pop. 3,500), about 38 miles above the mouth,

¹ See Appendix I, *Gazetteer of Towns*.

and the waterways of the Grijalva system in Tabasco, with which the Palizada connects through the Usumacinta.

The coast beyond Carmen is low, muddy, densely wooded, and featureless, and vessels are warned not to approach within less than 10 fathoms as far as Rio San Pedro, as depths are irregular.

Tabasco.—Practically the whole coast of Tabasco is low and fringed with mangroves and palms, and it is broken by a succession of estuaries: Rio San Pedro, a distributary of the Usumacinta; Rio Grijalva or Tabasco; Rio Chiltepec and La Boca, outlets of Rio Gonzalez, a distributary from the upper waters of the Grijalva; Rio Tupilco; Laguna Santa Anna, and Rio Tonalá. All these inlets have shallow bars.

By far the most important of them is the Grijalva estuary, on which is situated the chief port of Tabasco, Frontera.¹ The others have some trade in timbers, &c., but vessels of any considerable size must lie off shore in anchorages exposed to Northers. After the Grijalva, the Tonalá has probably the least difficult bar, with 8–10 ft. water.

Vera Cruz.—The coast north-westward of Rio Tonalá as far as the port of Vera Cruz is known as Sotovento or Leeward, in distinction from the Barlovento or Windward coast northward of that port.

From the Tonalá the coast is less broken and less liable to be marshy; as far as the Rio Coatzacoalcos (the next important river westward of the Tonalá) there is a shelving sandy beach usually free of heavy surf, where landing is easy; the country behind is devoid of lagoons, but is for the most part heavily timbered and very sparsely inhabited.

Puerto Mexico,¹ at the mouth of the Rio Coatzacoalcos, Atlantic terminus of the Tehuantepec railway, is the easternmost port of the Gulf coast of Mexico into which large vessels can enter.

Westward of Rio Coatzacoalcos the coast consists of dunes backed by the low valley of a winding creek which connects the river with the marshy lagoon of Ostion, which lies close

* See Appendix I, *Gazetteer of Towns*.

behind the shore, and opens to the sea through Rio Barilla, 15 miles from the Coatzacoalcos mouth.

At this point the coast turns abruptly north-north-west, and the land immediately behind it rises to considerable elevations where the slopes of Cerro San Martin descent to the coast. The culminating point of this range is the volcano of Tuxtla, which rises about 17 miles south of Roca Partida, a promontory about 60 miles from the Barilla.

This stretch of coast is alternately sandy and rocky, with several prominent points along it, and broken only by the Laguna de Santecomapan (Santa Comapa, or Zontecomapan). This lagoon has a difficult rocky entrance, which it has been proposed to improve so that an important harbour might be established here, with rail connexion from San Andres Tuxtla : at present the small settlement of Santecomapan at the head of the inner lagoon has a little local trade.

The promontory of Roca Partida has sheer cliffs, and the exceptional stretch of bold coast already described continues as far as Punta Puntilla. Beyond this, however, the high ground falls away, and the characteristic type of coast is resumed, regular, unbroken, and backed by the lowland, strewn with lagoons and in many places marshy, which is drained by the Rio Papaloapan and its tributaries to the Laguna de Alvarado. These rivers are important for inland navigation (see Chap. II, *Rivers*), and the head-quarters of this traffic is the port of Alvarado,¹ at the entrance to the lagoon, which, however, is approached from seaward over a bar where the depth never exceeds 14 ft. and is usually less.

The coast for some 24 miles beyond Alvarado Bar, as far as Bahia Anton Lizardo, is unsheltered and dangerous during the Northerers season. For about 12 miles it is backed by the lagoons of Alvarado and Caramonera, between which and the sea only a narrow sandy peninsula intervenes ; along this run the railway and track from Alvarado.

Reefs, known as the outer shoals of Vera Cruz, lie off Anton Lizardo, and between the southernmost of them and the

¹ See Appendix I, *Gazetteer of Towns*.

mainland there is secure anchorage in 7 to 11 fathoms, well protected from Northers.

Between Anton Lizardo and Punta Mocambo (10 miles) there are low dunes, with rivers, creeks, and marshes behind. At Punta Mocambo the railway, which otherwise runs, at most, a few hundred yards from the shore, passes behind a saddle-shaped hill. The coast continues low and sandy to Vera Cruz,¹ under normal conditions the principal port of Mexico. There is extensive anchorage under the reefs off the harbour, and the harbour itself, as described in Appendix I, is extensive and accessible by large vessels.

Northward of Vera Cruz there are reefs at intervals off the coast, which is backed by a chain of steep hills as far as Punta Delgada, after which they gradually recede. Beyond this point northward all the way to Rio Grande, the northern frontier of Mexico, there is little change in the general character of the coast. From Punta Delgada to Tuxpan, nearly 100 miles, it is of moderate height, in most places fronted by a sandy beach, and thickly covered with brushwood and small trees. Between the low coastal ridge and the hills behind there is a low-lying tract, marshy in places, and crossed by a number of streams; it probably floods extensively in the wet season.

Nautla and Tecolutla are small ports at the mouths of rivers of the same names, which have bars with about 5 ft. water at low tide; there is also a little trade at Rio Cazonas. At Tuxpan¹ Bar are sea-loading stations for oil. The anchorages here are open, but about 35 miles northward there is anchorage well sheltered from Northers under Isla de Lobos, and on the mainland abreast of this island another oil-loading port, Puerto Lobos, is in process of being established.

Northward of Tuxpan Bar the coast consists of a sandy spit rising 10–15 ft., backed by lagoons and channels connecting them all the way northward to the Panuco river. These inland waters are used by launches and barges in connexion with the oil trade, and canalization has been carried out, but owing to

¹ See Appendix I, *Gazetteer of Towns*.

caving of banks and silting it has proved difficult to maintain. About 10 miles northward of Tuxpan Bar is Barra de Tanguijo, an outlet from the southern portion of Laguna de Tamiahua. This bar has a depth of $3\frac{1}{2}$ –4 ft. at low water. Behind it a canal from Laguna de Tampamachoco (which communicates southward with Rio Tuxpan) joins the Rio de Tanguijo. The inland navigation southward of the Tanguijo is unsatisfactory, and boats bound from the north by the inland channel go out by Barra de Tanguijo in calm weather, and complete the voyage to the Tuxpan by sea, and *vice versa*.

Tamaulipas.—The port of Tampico¹ may be regarded as covering the lower course of the Rio Panuco, the town of Tampico lying about 5 miles up that river, while both below and above it there are a number of tank farms and wharves of oil companies, the port being the principal oil-exporting centre in Mexico.

The whole coast of Tamaulipas, from Rio Panuco northward to Rio Grande, is open and unsheltered, very sparsely populated, and almost devoid of communication with the interior. Over a very large proportion of its length of about 260 miles it is backed by lagoons, and where it is not, the land is generally so low that it is liable to extensive flooding in the wet season. There are many openings (*barras*) through the spit between the lagoons and the sea; some dry in the dry season, and the only one of any importance whatever for trade, Barra Soto la Marina, has only 6 ft. depth at that period, but the formation of a port here has been spoken of. Rio Grande, the frontier river, has a shifting and dangerous bar with a low-water depth of 3–5 ft.

Summary.—It will be seen from the above description that on the Atlantic coast of Mexico sheltered anchorages for vessels of any considerable size are very few; that only three ports—Puerto Mexico, Vera Cruz, and Tampico—can be entered by large vessels, and that elsewhere such vessels have to anchor off shore, sometimes at a great distance, and in roadsteads exposed to Northerners, which may necessitate the

¹ See Appendix I, *Gazetteer of Towns*

hasty departure of a vessel. While, during calm weather, the almost continuous sandy beach appears to afford plenty of opportunity for landing from boats, the coastal plains are for the most part not easily passable, by reason of lagoons, marshes, streams, or heavy vegetation, and except at the towns the population immediately along the coast is as a rule very scanty, except along parts of the coast of Yucatan and Campeche.

Pacific Coast

Soconusco.—From the Rio Suchiate, which forms the Mexican-Guatemalan frontier, to the head of the Gulf of Tehuantepec the coast is low-lying and fringed with sandy beaches backed by long shallow lagoons. The lagoons have outlets to the sea across shallow unnavigable bars. The coast is clean and free from dangers. Vessels can anchor anywhere near the shore, except in the vicinity of the lagoon outlets, but there is no shelter. Landing is generally difficult on account of the surf. The only ports are two open roadsteads, San Benito (Soconusco) and Puerto Arista (La Puerta). Puerto Arista has a pier but vessels cannot lie alongside on account of the swell. At the head of the Gulf of Tehuantepec on its western side is Salina Cruz.¹ It is one of the chief Pacific ports of Mexico but has lost some of its trade by the opening of the Panama Canal. There are large docks and considerable facilities for handling cargo.

Salina Cruz to Acapulco.—West of Salina Cruz the character of the coast changes. The highlands of the Sierra del Sur meet the sea and there is an alternation of bluff headlands and sandy bays, with rocks and rocky islets near the shore. Several of the bays afford limited anchorage for small vessels, but few are of any importance.

Puerto Angel has safe anchorage in 5-6 fathoms. A concession for the construction of a wharf was granted in 1917. The trade has fallen off since the opening of the Panama Canal.

¹ See Appendix I, *Gazetteer of Towns*.

A few miles west of Puerto Angel the rocky coast ends and gives way to sandy beaches backed by shallow lagoons. This type of coast is interrupted locally by bold headlands.

Acapulco Bay is the finest natural harbour on the Pacific coast of Mexico. There is ample sheltered anchorage for large vessels but there are no docks and only poor facilities for handling cargo.

Acapulco to Manzanilla.—The same type of coast-line continues. Long stretches are quite smooth and afford no shelter but there are a few small bays with anchorage and within the shelter of which landing is possible.

Sihuatanejo Bay is the most important of these. Attempts failed to make Maruata Bay a port of entry. Difficulty of access to the interior is a drawback to all these bays but there is some local trade in dyewoods.

Near Manzanilla the lagoons are more prominent and immediately east of that port the railway from Manzanilla to the interior follows the beach between Cayatlan lagoon and the sea.

Manzanilla lies on the south of Manzanilla Bay. The port is protected by a long breakwater and affords sheltered anchorage for large vessels. Further extensive improvements are projected. The volume of trade used to be larger than that of any other west coast Mexican port with the possible exception of Salina Cruz but has fallen off in recent years.¹

Manzanilla to San Blas.—This stretch of coast is mainly bold and rocky but in places is low, sandy, and fringed with lagoons. Several large bays afford fair anchorage but there are no ports. It is intended, however, to form a port at Chamela, about 70 miles NW. of Manzanilla, and the construction of a railway between Guadalajara and Chamela is reported to have begun in 1917.

Banderas Bay is 20 miles long and about 15 miles wide. Its shores are rocky and inaccessible except at the head. Las Peñas is a small village at the south-east corner of the bay with some trade in dyewoods.

¹. See Appendix I, *Gazetteer of Towns*.

Las Tres Marietas are a group of rocky islets lying a few miles south-west of Mita Point, the northern headland of Banderas Bay. They have no anchorage. In 1914 they were leased to a Mexican guano company.

San Blas lies on a shallow creek which is rapidly silting up. Vessels must anchor in an open roadstead. The port offers no facilities and is little used. It is very unhealthy and in the wet season the majority of its 2,000 inhabitants migrates to Tepic, about 25 miles inland.

San Blas to Mazatlan.—The coast is low, sandy and fringed with lagoons. There is no deep water near in shore except off the river mouths and lagoon entrances. There are no sheltered anchorages and landing is possible only in the absence of surf.

Las Tres Marias are three islands which lie 60–100 miles west of San Blas. They are lofty and rugged. On the south-east of Maria Madre there is fair anchorage. Maria Madre and Cleopha were leased in 1913 for their timber. At least until recent years there was a large penal settlement on Maria Madre. It may still exist. In 1910 there were 2,000 convicts and a guard of 200 soldiers. The smallest of these islands and some rocks nearer the mainland are exploited for guano.

Mazatlan¹ is a large town but trade is restricted by the poor harbour. The anchorage is somewhat exposed and large vessels have to lie a mile or more from the town. A proposal to build a large artificial port was transferred to Manzanilla.

Mazatlan to Guaymas.—This is the southern half of the east coast of the Gulf of California. It is low, sandy, and fringed by lagoons. The coastal waters are shallower than further south. Off the river mouths and outlets of the lagoons shoals extend seawards for some miles. There are few bold headlands. Punta Piastra about 35 miles north of Mazatlan is 156 ft. high. In the bay northward of the point there is a small pier where landing is sometimes possible and vessels occasionally load dyewoods. Punta San Miguel, 9 miles further north, is another conspicuous point.

¹ See Appendix I, *Gazetteer of Towns*.

Altata is a small port which lies on a long narrow lagoon behind the low sandy Lucenilla Island. The present entrance is Tonina Bar at the south end of the islands. The entrance is difficult and is reported to have $4\frac{1}{2}$ fathoms at low water but only 2 fathoms inside towards the town. The depth, however, is continually changing. There is a custom-house but no pier or wharves. The town, which has a population of about 300, is small and built of adobe. It is very unhealthy. Trade is small.

Periheute is the custom-house at the mouth of the river which flows into Estero Playa Colorado. The bar has 9 ft. of water during the dry season. Large vessels cannot enter but must anchor 4 miles south-west of the entrance. The village, which has a population of about 200, is called Playa Colorado.

Topolobampo harbour is a long inlet of the sea, between ranges of low hills, about 100 miles north of Altata. The entrance is narrow and difficult and is liable to change. Only $2\frac{1}{4}$ fathoms are reported on the bar. The inner anchorage lies 9 miles from the bar up a narrow winding channel which cannot be safely navigated by vessels of more than 14 ft. draught. The inner anchorage is safe in all winds. The town is little more than a collection of shanties and has a population of about 300. There is a wharf with 18 ft. of water alongside.

North of Topolobampo the coast is low and sandy. At a few places vessels load dyewoods. Estero de Agiabampo, at the entrance to which there is a light, has only 2 fathoms on the bar but is frequented by coasting vessels. There are custom-houses at Agiabampo and Bahia Santa Barbara. In neither place is there any shelter for large vessels.

Guaymas Bay is an almost landlocked bay studded with islands. The western side skirted by barren hills, about 1,500 ft. high, and the eastern side is low. Vessels of 18 to 20 ft. draught can lie in the outer harbour, inside Punta Baja and Morro Ingles, 1 to 2 miles from the town. Only vessels of less than 10 ft. draught can lie west of Almagre and Ardilla,

off the town. Guaymas¹ is a busy port and the town has grown rapidly in recent years but the opening of the Southern Pacific Railway caused some decrease in the trade of the place since goods can now enter by rail from the United States.

Empalme lies on the shallow lagoon at the north end of Guaymas Bay, 5 miles from Guaymas. It is a new town growing round the workshops of the Southern Pacific Railway. In 1910 it had a population of 1,200, almost entirely railway employés. Proposals to make Empalme a port have come to nothing. The shallow water in the lagoon prevents any approach by sea.

Sonora.—From Guaymas to the head of the Gulf of California is a distance of about 320 miles. The greater part of this coast-line is sandy, and much indented. Except off the river mouths there is deep water near in shore. A little north of Guaymas there are a few coves affording sheltered anchorage for small vessels. The two most important are Ensenada Bocochibampo and Puerto San Carlos.

Tiburon Island has an area of about 400 square miles and rises to a height of 3,995 ft. It is inhabited by Indians.

North of Tiburon Island the Sonora desert begins but the coast changes little in character. The only port is Libertad or Port Lobos which has a custom-house and some trade in mineral ores. The anchorage is sheltered only from the north-west and north. Wharves and a railway were projected some years ago but nothing has been constructed so far.

The last 90–100 miles of this coast is low, sandy, relatively smooth and faced with shoal water. The width of the belt of sand dune is as much as 15 miles in places. At the west corner of George Bay there is a 10-mile railway (3-ft. gauge) from the coast to Las Pintas mines. For the Rio Colorado see p. 29.

Lower California: East Coast.—The coast is rugged and generally precipitous except in the extreme north and in certain bays toward the south. For the most part it is arid, little inhabited and incompletely surveyed. There is

¹ See Appendix I, *Gazetteer of Towns*.

deep water near in shore. Large and small islands are numerous some of which have importance for their guano deposits and others for salt lagoons. Both on the mainland and on several of the islands there are numerous anchorages but the only sheltered harbours are in the southern half of this coast.

Santa Rosalia ¹ in lat. 27° 21' N. is a large mining settlement with an artificial harbour. The town and harbour belong to the Boleo Copper Company (French).

Mulege at the mouth of Conception Bay is a straggling village decaying at the expense of Santa Rosalia, from which it is about 40 miles distant.

Conception Bay is 22 miles long and 2-5 miles wide. It is reported to have a depth of 17 ft. in its entrance channel and 3-17 fathoms inside. There is good sheltered anchorage in several places.

Loreto, in lat. 26' N., was once the capital of Lower California but is now a village of about 150 inhabitants with decreasing trade.

Carmen Island has a useful anchorage on the east in Salinas Bay, where there is a wharf connected by a tramway with a salt lake worked by a British company.

La Paz Bay is the largest bay on this coast. It is 40 miles long and 16-20 miles wide. It has deep water throughout and is believed to be free from dangers. On the south-east of the bay lies the small town of La Paz ¹, the capital and seat of government of Lower California.

Espiritu Santo and other islands on the east of La Paz Bay are important for their pearl fisheries which are in the hands of a British company.

Pichilique harbour is on the eastern side of La Paz Bay between San Juan Nepomezeino Island and the mainland. It is a small but well protected harbour suitable for deep draught vessels. There are two short piers on the island. One, 120 ft. long, belongs to the Pearl Shell Company which owns the island and works a salt lagoon. The other, of about

¹ See Appendix I, *Gazetteer of Towns*.

the same length, leads to the coal shed where the United States Government keeps a store of coal for naval use. The store has a capacity of 10,000 tons. About 7,000 tons are usually kept in stock. The coal pier has a tramway. Vessels of 12 ft. draught can lie alongside but coaling is generally done by lighters, of which there are 6 of 70-tons capacity each. The dépôt is in charge of the United States Consul at La Paz.

Buena Vista on Palmas Bay is a village with a post office. Anchorage is very exposed.

San Jose del Cabo is a prosperous village 22 miles east of Cabo Falso, the southern extremity of Lower California. Anchorage is in an open roadstead generally disturbed by heavy swells which makes landing difficult. The port has no wharf. The town has a population of about 2,000 Mexicans and Indians and is growing in importance as an agricultural centre, for the fertile San Jose valley. It has supplanted San Lucas 16 miles further west which used to be the principal port of the district.

Lower California: West Coast.—As far as Punta Lobos, about 40 miles north of Cape False the coast is bold and rocky, and there are no harbours. From Punta Lobos to Punta el Conejo, a distance of 89 miles in a north-west direction, the coast is low, sandy, and barren. There are no harbours but vessels can anchor anywhere off the coast. Landing is difficult. Beyond Punta el Conejo the coast becomes more varied. There are several large bays and shallow lagoons. Santa Margarita Island is volcanic and lofty.

Magdalena Bay is 17 miles long and 12 miles wide, and has an area of about 100 square miles with a depth of 5–24 fathoms. There is a custom-house and a small village at Man-of-War Cove on the west side. The village, known as Magdalena, has a boat wharf. Until 1911 the United States had two coal hulks in Magdalena Bay. In that year the lease expired and was not renewed.

North of Magdalena Bay the coast is low and sandy for 60 or 70 miles, after which it is, in the main bold and rocky with sandy beaches and lagoons at the head of the larger bays.

The whole extent of coast-line is barren and of little importance.

Port San Bartolome on the south of the peninsula which forms the southern side of Sebastian Viscaino Bay is circular and about $2\frac{1}{2}$ miles in diameter. It affords safe anchorage, and as a rule, good landing.

Cerros Island, off Sebastian Viscaino Bay, is a large volcanic island which rises to a height of 3,950 ft. The northern part is forested and there are gold and copper mines. In 1917 the Mexican Government was preparing a scheme of colonization. There are several anchorages. The settlement, with a short pier, is on the eastern side, about $\frac{3}{4}$ mile south of the north-east point.

San Benito Islands are a group of three barren rocky islands 15-19 miles west of Cerros Island. On the south of the west island there is good anchorage.

San Quentin Bay is a wide open bay at the north side of which is Puerto San Quentin, a creek which affords secure anchorage to small vessels, but has a difficult entrance much obstructed by shoals. This place was the site of an ambitious attempt at colonization by a British company (Lower California Development Co.) which built a railway north to San Ramon, a distance of 16 miles and laid telegraph and telephone wires to Ensenada. The present settlement is on the west of the port about 4 miles north of Cabo San Quentin. It has a small pier but there is little trade.

Ensenada de Todos Santos¹ lies in the shelter of Ensenada Point on the north-east of Todos Santos Bay. It has some importance as a mining centre. The pier has been damaged and the wharf and breakwater, begun in 1913 by a Canadian company, have made little progress owing to the revolutionary movement.

From Ensenada to the United States frontier the coast-line is 44 miles long. It is rocky and unindented. The boundary is marked by a white marble obelisk, 200 yds. from the beach. Its latitude is $32^{\circ} 31' 58.46''$ N.

¹ See Appendix I, *Gazetteer of Towns*.

Los Coronados Islands are a group of four high barren rocks lying 7 miles south-west of the boundary monument. Anchorage, well protected from the south-west, can be found on the east of the largest island.

Outlying Islands.—Guadalupe Island lies in lat. $29^{\circ} 11' N.$, long. $118^{\circ} 17' W.$, 137 miles from the nearest point on the Mexican coast. It is about 20 miles long and 3–7 miles broad and rises to an elevation of 4,500 ft. The best anchorage is in Melpomene Cove at the south end of the island. The island is at present uninhabited, but in 1917 the Mexican Government was exploring it with a view to renewing its use as a military settlement.

Revilla Gigedo Islands are a group of three uninhabited islands and a rock lying between lat. $18^{\circ} 20' N.$ and $19^{\circ} 20' N.$, and long. $110^{\circ} 45' W.$ and $114^{\circ} 50' W.$ Braithwaite Bay on the south-east of Socorro, the largest island, has good anchorage.

LIGHTHOUSES, ETC.

The lights on both coasts are given in order from south to north. The distance (in nautical miles) at which a light is visible is in clear weather.

Atlantic Coast

Xcalak, $18^{\circ} 15' N.$, $87^{\circ} 50' W.$ Red iron tower, stone base, 39 ft. high. White occulting light, 42 ft. above high water, visible 12 miles.

Banco Chinchorro (Cayo Lobos), $18^{\circ} 23' N.$, $87^{\circ} 23' W.$ Red skeleton tower, 39 ft. high. White group flashing light (three flashes), 42 ft. above high water, visible 12 miles. White wooden dwelling.

Banco Chinchorro (Cayo Norte), $18^{\circ} 46' N.$, $87^{\circ} 19' W.$ Grey truncated pyramid, 43 ft. high. White flashing light (5 secs.), 52 ft. above high water, visible 13 miles. White dwelling, red roof.

Bahia Espiritu Santo (Punta Herrero), $19^{\circ} 18' N.$, $87^{\circ} 27' W.$ White cylindrical iron tower, 72 ft. high. White group

flashing light (four flashes, 5 secs. ; eclipse 5 secs.) 75 ft. above high water, visible 14 miles. Red dwelling.

Allen Point, 19° 47' N., 87° 29' W. Red iron truss 66 ft. high. White group occulting light (two eclipses, 1 sec. each ; light between eclipses, 1 sec. ; between groups, 6 secs.), 72 ft. above high water, visible 10 miles. Red hut.

Cozumel Island (Punta Celarain), 20° 17' N., 87° 1' W. Red iron skeleton tower, 72 ft. high. White flashing light (quick flash every 5 secs.), 75 ft. above high water, visible 14 miles. White wooden dwelling.

Cozumel Island (San Miguel), 20° 30' N., 86° 58' W. White wooden tower 30 ft. high. White fixed light 33 ft. above high water, visible 10 miles.

Cozumel Island (Punta Molas), 20° 36' N., 86° 44' W. Red iron framework tower 43 ft. high. White group flashing light (3 flashes), 15 secs., 56 ft. above high water, visible 13 miles. Red dwelling.

Puerto Morelos, 20° 48' N., 86° 57' W. Red hut with iron standard above grey stone base, 36 ft. high. White group occulting light (two eclipses), 43 ft. above high water, visible 10 miles. White wooden dwelling, red roof.

Isla Mugeris (south-east point), 21° 12' N., 86° 43' W. Red framework tower, 39 ft. high. Red group flashing light (two flashes) 89 ft. above high water, visible 15 miles. Provisional light. Grey house with red roof.

Isla Contoi (near north point), 21° 33' N., 86° 49' W. Pyramidal tower, 112 ft. high, at corner of dwelling, red and white bands. White flashing light, 5 secs., 108 ft. above high water, visible 16 miles.

Cabo Catoche, 21° 37' N., 87° 4' W. Red iron frame tower, 39 ft. high. White group flashing light (four flashes, 10 secs.), 43 ft. above high water, visible 11 miles. Red dwelling.

El Cuyo, 21° 31' N., 87° 42' W. Red iron hut on masonry base, 13 ft. high. White occulting light 59 ft. above high water, visible 13 miles.

Punta Yalkubu, 21° 32' N., 88° 37' W. Pyramidal tower,

112 ft. high, attached to hut, red and white bands. White flashing light (5 secs.), 108 ft. above high water, visible 16 miles.

Progreso, 21° 17' N., 89° 39' W. Grey masonry tower, white cupola, 105 ft. high. White flashing light (9 secs. per minute), 115 ft. above high water, visible 16 miles.

Progreso, pier lights: red fixed, Canton, Rotger, and Porfirio Diaz piers; green fixed, Otero and Customs piers.

Alacran Reef (Perez Island), 22° 24' N., 89° 24' W. Red iron framework tower, 72 ft. high. White group flashing light (two flashes: eclipse between them, 3 secs.; between groups, 7 secs.) 72 ft. above high water, visible 15 miles. White dwelling with red roof.

Sisal, 21° 10' N., 90° 3' W. Red cylindrical masonry tower above old bastion, 62 ft. high. White group flashing light (two flashes, 1½ secs.; eclipse 8½ secs.) 66 ft. above high water, visible 13 miles.

Celestun, 20° 51' N., 90° 24' W. Red hut with iron standard, stone base, 33 ft. high. White occulting light 36 ft. above high water, visible 10 miles.

Campeche, 19° 51' N., 90° 33' W. San Jose church tower, 82 ft. high. White fixed light 95 ft. above high water, visible 14 miles.

Seiba Playa, 19° 42' N., 90° 41' W. White octagonal masonry tower with dwelling, 49 ft. high. White group flashing light (period 10 secs., three flashes), 164 ft. above high water, visible 19 miles. Storm signals.

Champoton, 19° 21' N., 90° 43' W. White mast on old rampart, 39 ft. high. White fixed light 46 ft. above high water, visible 10 miles.

Laguna de Terminos:

(1) Punta del Tigre, SW. point of Aguada Island, 18° 47' N., 91° 30' W. White tower and house, 66 ft. high. White group flashing light (four flashes), 66 ft. above high water, visible 13 miles.

(2) Atalaya, Carmen Island, 18° 31' N., 91° 52' W. White masonry tower, red dome, 66 ft. high. White fixed light,

with red sector from 88° through east to 113° , 62 ft. above high water, white light visible 13 miles, red 7 miles.

(3) Tio Campo, entrance to Palizada River, $18^{\circ} 15' N.$, $91^{\circ} 50' W.$ White wooden tower, 36 ft. high. Unwatched white fixed light 30 ft. above high water, visible 10 miles.

(4) Xicalango, leading lights for Carmen port, 180° , 300 yds. apart: *front*, metal tower 33 ft. high, white fixed light 39 ft. above high water, visible 11 miles; *rear*, $18^{\circ} 38' N.$, $91^{\circ} 55' W.$, red circular brick tower 97 ft. high, white flashing light (30 secs.) 95 ft. above high water, visible 15 miles. Storm signals.

Cayos Arcas, leading lights, 107° , 118 yds. apart: *front*, masonry column 16 ft. high, white fixed light 23 ft. above high water, visible 9 miles; *rear*: $21^{\circ} 12' N.$, $91^{\circ} 58' W.$, red iron tower 72 ft. high; white group flashing light (flash, $2\frac{1}{2}$ secs. eclipse, flash, $7\frac{1}{2}$ secs. eclipse), 72 ft. above high water, visible 14 miles. Wooden dwelling.

Cayo Arenas, $22^{\circ} 7' N.$, $91^{\circ} 25' W.$ White cylindrical iron tower 72 ft. high. Red group flashing light (reported to appear white at limit of visibility; two flashes, $3\frac{1}{2}$ secs.), 72 ft. above high water, visible 14 miles. Red dwelling.

West Triangle, $20^{\circ} 58' N.$, $92^{\circ} 19' W.$ Red cylindrical tower, 72 ft. high. White group flashing light (four flashes in 10 secs.; eclipse 5 secs.), 72 ft. above high water, visible 14 miles.

Frontera (entrance of Rio Grijalva), $18^{\circ} 39' N.$, $92^{\circ} 42' W.$ White tower, eight iron columns, 82 ft. high. White flashing light (period 40 secs.), 79 ft. above high water, visible 14 miles. Has been reported irregular.

Tupilco River (west side of entrance), $18^{\circ} 27' N.$, $93^{\circ} 28' N.$ Masonry tower, 62 ft. high. White group flashing light (four flashes), 66 ft. above high water, visible 13 miles.

Tonalá (west bank, entrance to Rio Tancochapa), $18^{\circ} 12' N.$, $94^{\circ} 10' W.$ Square masonry tower, 56 ft. high, and house, red and white bands. White group flashing light (two flashes, 5 secs.), 79 ft. above high water, visible 14 miles. Reported extinguished, 1916.

Puerto Mexico, east bank Coatzacoalcas River, leading lights, 162° , 219 yds. apart: *front*, white wooden tower 36 ft. high, red occulting light 36 ft. above high water, visible 11 miles; *rear*, white wooden tower 62 ft. high, red group occulting light (three eclipses) 59 ft. above high water, visible 13 miles.

Puerto Mexico, $18^{\circ} 9' N.$, $94^{\circ} 25' W.$ Wooden tower, red and white stripes, 36 ft. high. White group flashing light (three flashes in 9 secs., eclipse 9 secs.), 118 ft. above high water, visible 16 miles.

Punta Zapotitan, $18^{\circ} 34' N.$, $94^{\circ} 48' W.$ White wooden framework tower, 16 ft. high. White flashing light 29 ft. above high water, visible 10 miles. Has been reported unreliable.

Roca Partida, $18^{\circ} 45' N.$, $95^{\circ} 12' W.$ White wooden frame tower 30 ft. high. White group flashing light (four flashes in quick succession), 292 ft. above high water, visible 24 miles. Has been reported unreliable.

Alvarado (east point of entrance). Small red square building, white cupola, 13 ft. high. White fixed light 75 ft. above high water, visible 14 miles.

Santa Guilla, $19^{\circ} 9' N.$, $95^{\circ} 49' W.$ Red iron tower 70 ft. high, with wooden dwelling. Red fixed light 59 ft. above high water, visible from 3° to 54° over Cabeza reef, and from 85° to 126° over Anegada reef. White group flashing light (flash, $2\frac{1}{2}$ secs. eclipse, flash, $7\frac{1}{2}$ secs. eclipse), 69 ft. above high water, visible 14 miles.

Isla Medio, $19^{\circ} 5' N.$, $95^{\circ} 56' W.$ White cylindrical stone tower, 45 ft. high, over square dwelling. Fixed light with sectors, white from 147° to 220° , red thence to 260° , white to 268° , red to 299° , white to 327° ; obscured elsewhere; 46 ft. above high water, visible 12 miles.

Anton Lizardo, on reef, $19^{\circ} 3' N.$, $95^{\circ} 55' W.$ Red triangular skeleton tower. Unwatched white group flashing light (three flashes), 33 ft. above high water, visible 11 miles.

El Giote, NW. of Punta Anton Lizardo. Red iron column. Unwatched red fixed light 26 ft. above high water, visible 10 miles

Banquilla de Anton Lizardo (Isla Blanca), $19^{\circ} 5' N.$, $96^{\circ} W.$ White triangular skeleton tower. Unwatched white group occulting light (three eclipses) 33 ft. above high water, visible 11 miles.

Vera Cruz :

(1) Isla Verde, $19^{\circ} 11' N.$, $96^{\circ} 4' W.$ Red hexagonal masonry tower. Unwatched white group occulting light (four eclipses) 30 ft. above high water, visible 10 miles.

(2) Sacrificios, $19^{\circ} 10' N.$, $96^{\circ} 5' W.$ Red iron tower 33 ft. high on masonry base. Light in sectors not sharply defined—red fixed from 134° to 157° over Gallega reef; white fixed thence to 164° ; green fixed to 187° over Banquilla reef; white fixed to 195° ; red fixed to 238° , over Anegada de Adentro and Isla Verde reefs; while occulting every 6 secs. to 336° ; white fixed to 134° over Sacrificios Island anchorage. Visible 11 miles.

(3) Benito Juarez, Promenade Wharf. White clock-tower 138 ft. high. White flashing light ($\frac{1}{2}$ sec., at 5 secs. periods), 144 ft. above high water, visible 18 miles.

(4) Banquilla de Vera Cruz, $19^{\circ} 13' N.$, $96^{\circ} 6' W.$ Triangular skeleton tower, red and white bands. Red group flashing light (two flashes; eclipse between flashes, 3 secs; between groups, 9 secs.), 33 ft. above high water, visible 11 miles.

(5) Anegada de Adentro, $19^{\circ} 13' N.$, $96^{\circ} 4' W.$ White lattice post on metal base. Unwatched red occulting light 56 ft. above high water, visible 13 miles.

(6) Vera Cruz Harbour has unwatched red group occulting light (three eclipses, 4 secs. period) at extremity of south-eastern breakwater, unwatched green fixed light at extremity of north-eastern breakwater, green fixed lights at north-west and south-east corners of head of Vera Cruz mole, red fixed light at head of passenger mole, unwatched red fixed light at extremity of inner pier.

Punta Delgada, $19^{\circ} 49' N.$, $96^{\circ} 27' W.$ White iron tower 72 ft. high. White group flashing light (three flashes of 1 sec. each; eclipse between flashes, 1 sec.; between groups, 5 secs.), 148 ft. above high water, visible 18 miles.

Rio Nautla, north bank, $20^{\circ} 17' N.$, $96^{\circ} 47' W.$ White framework tower 47 ft. high. White occulting light 55 ft. above high water, visible 12 miles.

Tecolutla, north bank of river, $20^{\circ} 30' N.$, $97^{\circ} 2' W.$ Tower 46 ft. high over house, with red and white bands. White group occulting light (two eclipses) 52 ft. above high water, visible 12 miles.

Rio Tuxpan (Tuxpan Bar, north side), $20^{\circ} 59' N.$, $97^{\circ} 19' W.$ White wooden frame 56 ft. high, and dwelling. White group occulting light (four eclipses) 59 ft. above high water, visible 13 miles (doubtful; the lights of the oil company's settlement may be seen first).

Isla Lobos, $21^{\circ} 28' N.$, $97^{\circ} 13' W.$ White iron tower, 54 ft. high. White flashing light (5 secs.), 56 ft. above high water, visible 13 miles.

Tampico, head of south jetty. White iron tower above white hut. Red flashing light 33 ft. above high water, visible 5 miles.

Tampico, La Barra, north side of river entrance, $22^{\circ} 16' N.$, $97^{\circ} 49' W.$ Red hexagonal iron tower, 141 ft. high. White group flashing light (three flashes in quick succession, 30 secs. period), 141 ft. above high water, visible 18 miles.

Punta Jerez, $22^{\circ} 54' N.$, $97^{\circ} 46' W.$ White cylindrical iron tower 72 ft. high. White group flashing light (two flashes), 72 ft. above high water, visible 14 miles.

Pacific Coast

Puerto San Benito, $14^{\circ} 42' N.$, $92^{\circ} 27' W.$ White cylindrical tower on north-west of town, 72 ft. high. Flashing white light showing two flashes every five seconds. Light 74 ft. above high water, visible 14 miles. Dwelling at base on southern side. Reported untrustworthy.

Puerto Arista, $15^{\circ} 57' N.$, $93^{\circ} 50' W.$ White wooden tower, 33 ft. high, 100 yds. from the coast-guard station. Occulting white light 36 ft. above high water, visible 11 miles. Dwelling, painted white, on north-west side.

Salina Cruz, east breakwater Unwatched fixed white

light on end, 43 ft. above high water, on red metal pillar. Visible 11 miles.

Salina Cruz, west breakwater. Unwatched fixed red light on end, 43 ft. above high water on white metal pillar. Visible 9 miles.

Morro de Salinas, $16^{\circ} 09' N.$, $95^{\circ} 11' W.$ White octagonal masonry tower 49 ft. high. Flashing white light 272 ft. above high water, visible 23 miles. White rectangular dwelling adjoining.

Morro Ayuta, $15^{\circ} 52' N.$, $95^{\circ} 47' W.$ White square tower of reinforced concrete 54 ft. high on bold headland. Flashing white light 148 ft. above high water visible 17 miles. Illuminant is petroleum vapour burned under an incandescent mantle. House adjacent, painted white.

Puerto Angel (Izuca Point), $15^{\circ} 39' N.$, $96^{\circ} 31' W.$ White octagonal stone tower 43 ft. high with white rectangular dwelling attached. Flashing white light 184 ft. above high water, visible 19 miles.

Minizo anchorage (near east end of Alotengo lagoon), $16^{\circ} 6' N.$, $97^{\circ} 59' W.$ Square white tower 34 ft. high. Occulting white light, 43 ft. above high water, visible 11 miles.

Maldonado (Cuacual Point), $16^{\circ} 19' N.$, $98^{\circ} 33' W.$ Wooden tower 20 ft. high. Flashing white light, 98 ft. above high water, visible 15 miles. This light is provisional pending the erection of a permanent lighthouse and is reported unreliable.

Acapulco, $16^{\circ} 49' N.$, $99^{\circ} 56' W.$ White pyramidal wooden tower 30 ft. high on summit of Roqueta Island. Dwelling, with red roof, adjoining. Flashing white light, 377 ft. above high water, visible 26 miles. Reported unreliable.

Acapulco, pier lights. Fixed red light on end of custom-house pier. Fixed red light (unreliable) on inner of two white rocks.

San Telmo, $18^{\circ} 19' N.$, $103^{\circ} 30' W.$ White concrete tower 51 ft. high. Flashing white light 226 ft. above high water, visible 21 miles. Hut adjoins lighthouse. Reported unreliable.

Punta de Campos (Manzanilla), $19^{\circ} 1' N.$, $104^{\circ} 21' W.$

White wooden tower on house 30 ft. high. Flashing white light 357 ft. above high water, visible 26 miles.

Manzanilla breakwater. Occulting red and white light on a crane at the end, 69 ft. above high water, visible 10 miles. Said to be replaced by fixed red light of small power.

Cape Corrientes, 20° 24' N., 105° 43' W. White octagonal stone tower 51 ft. high, over white dwellings; lantern painted red. Flashing white light 305 ft. above high water, visible 24 miles.

Las Peñas (near Customs boat house), 20° 37' N., 105° 15' W. Leading lights to the anchorage off the mouth of the Rio Real, shown from dusk to midnight. Two wooden posts with red and white stripes bearing fixed red lights, the front one 36 ft. and the rear one 118 ft. above high water.

Puerto San Blas, 21° 32' N., 105° 19' W. Square wooden framework tower above dwelling, both painted white, west of signal station on Vigia Hill. Flashing white light 154 ft. above high water, visible 18 miles.

Maria Madre Island (Balleto Point), 21° 36' N., 106° 33' W. White stone pillar 13 ft. high. Flashing white light 279 ft. above high water, visible 23 miles. Reported extinguished, 1915.

Creston Island (Mazatlan). On west side of harbour entrance. Square white tower 36 ft. high rising from white house; red lantern. Occulting white light 515 ft. above high water, visible 30 miles.

Mazatlan harbour. Fixed red electric light on the end of the customs pier.

Lobos Island, 27° 20' N., 110° 38' W. On north-west point. An iron tower 19 ft. high, painted with white and red bands above a red house of concrete. Flashing white light 69 ft. above high water, visible 14 miles.

Cape Haro (Guaymas), 27° 51' N., 110° 54' W. Red cylindrical iron tower 24 ft. high. Dwelling adjacent. Fixed and flashing white light 348 ft. above high water, visible 25 miles. Wireless poles in rear of lighthouse.

Pajaros Island (Guaymas), 27° 53' N., 110° 52' W. White

wooden skeleton tower 34 ft. high. Dwelling, white with red roof, adjoining. Occulting white light 75 ft. above high water, visible 14 miles.

Agiabampo, 26° 16' N., 109° 17' W. White wooden tower, with white hut adjoining, 33 ft. high. Occulting white light 98 ft. above high water, visible 10 miles.

Santa Rosalia, 27° 21' N., 112° 17' W. Harbour lights. A green fixed electric light is shown from the end of the north breakwater, 36 ft. above high water, visible 5 miles. A red fixed electric light is shown on the end of the south breakwater.

Loreto, 26° 00' N., 111° 20' W. On shore 275 yds. east of village. White iron column 30 ft. high. White dwelling adjoining. Fixed white light 28 ft. above high water, visible 10 miles.

Prieta Point (La Paz), 24° 13' N., 110° 18' W. White wooden tower 33 ft. high with dwelling adjoining. Occulting white light 56 ft. above high water, visible 10 miles.

La Paz. Fixed green light at head of pier. Fixed red light 32 ft. above high water on red tabular iron structure on beach near custom house, visible 6 miles.

San Jose del Cabo, 23° 3' N., 109° 40' W. On Miramar Hill. White wooden tower 33 ft. high with white dwelling attached. White stone building with tile roof adjoining. Occulting white light 56 ft. above high water, visible 13 miles. Sugar mill with detached chimney 219 yds. to north.

Cabo Falso, 22° 52' N., 109° 58' W. Red octagonal tower 52 ft. high with white lantern and cupola. Red dwelling adjoining. Flashing white light, 262 ft. above high water, visible 23 miles.

Magdalena Bay (Man-of-War Cove), 24° 38' N., 112° 9' W. Red tubular iron tower 26 ft. high. Occulting white light, 30 ft. above high water, visible 10 miles.

Ensenada, 31° 52' N., 116° 38' W. Fixed red light on wooden post at end of wharf, visible 2 miles

CHAPTER VII

MISCELLANEOUS

General conditions of health—Hospitals and medical service—Sanatoria—
Prevalent diseases—Foreign consuls—Newspapers.

GENERAL CONDITIONS OF HEALTH

IN the low hot lands of Mexico many of the ordinary tropical diseases are prevalent. Of the two coastal areas, the Gulf Coast appears to be less healthy than the Pacific. The definitely tropical diseases may be taken to disappear, roughly speaking, above the elevation of about 3,000 ft., and much of the central plateau, so far as concerns natural conditions, is very healthy.

The opinion is expressed by a writer in the *Journal of the Military Service Institution*, Jan.-Feb., 1912, that from the point of view of health conditions generally, military operations, if possible, should not be attempted in the coast regions during the months from July to October, while on the plateau this (the rainy) season, despite its disadvantages, is probably the more favourable. Another report mentions the period December to May as the most suitable season for operations in Quintana Roo and Yucatan.

HOSPITALS AND MEDICAL SERVICE

Most of the large towns have hospitals, which are said to be generally well administered. Some of the chief of them are mentioned in the descriptions of towns in Appendix I. In addition, there are many free dispensaries throughout the Republic. Under settled conditions, both the Federal and the State governments paid attention to public health. On many of the large haciendas, also, medical service is provided either free or at a small charge. The medical profession is said to be efficient, and includes not only Mexicans but a large number of American doctors and surgeons. Nominally no

person, whether a native or a foreigner, is allowed to practise medicine, pharmacy, obstetrics, or dentistry unless a graduate of an authorized college or university. But neither the medical nor the sanitary service is efficient everywhere ; in some parts they are wanting. The common people often refrain from calling in a doctor except in extreme cases, preferring to trust either priests or native apothecaries. The latter possess a few drugs (chiefly medicinal plants), of whose properties they know little, and use charms freely.

A medical military school was opened in Mexico City in 1916.

SANATORIA

A majority of the best-known health resorts in Mexico are points where medicinal springs are found ; such springs are numerous in several parts of the country. In the north, Topo Chico, 4 miles north-west of Monterey, has the most noted springs in Nuevo Leon ; the hot waters are reputed to be efficacious against rheumatism, and are bottled for export. Other springs in the same State are at San Ignacio, near Linares, Potrero Prieto, near Galeana, La Bosa, near Santiago Guayuco, and Huertas, 18 miles south of Montemorelos. In Chihuahua, the hot springs 3 miles from Santa Rosalia are celebrated throughout Mexico, and there is extensive accommodation here. There are also springs at San Diego, Cochinitillas, Carmen, Carrizal, Chuviscar, and Tehuichic in Chihuahua. Aguascalientes, capital of the State of that name, has a reputation not only for its hot springs but also for its fine climate, and is frequented on that account. Leon, in Guanajuato, also enjoying a good climate, has a sanatorium. At Comanjilla in the same State, 6 miles from Silao, there are medicinal springs with some local reputation. Lake Chapala in Jalisco, though not specially a sanatorium, is a resort from Guanajuato city and other places : the chief points on it are Ribera Castellanos and Chapala village. Among places which rank highest among health resorts for dwellers in Mexico City, Cuernavaca and Cuautla in Morelos may be mentioned ; there are sulphur springs 2 miles north-east of the latter. Zoyancingo is another resort, but its altitude is much greater

(8,100 ft.), and its climate is said to be specially favourable for pulmonary complaints. At Tehuacan in Puebla there are numerous springs said to be similar to those of Carlsbad, and the water is exported. Orizaba in Vera Cruz serves as a health resort for inhabitants of Vera Cruz city and elsewhere ; visitors even from Yucatan are (or were) accustomed to live here in summer.

It does not appear, however, that there is large accommodation at all these points ; probably the best in this respect are Santa Rosalia, Aguascalientes, Leon, Cuernavaca, and Orizaba.

PREVALENT DISEASES

Malaria, one of the commonest diseases in the hot lands, appears in various forms, most usually the so-called *paludismo*, *calentura* (ague), and other mild types ; the pernicious forms are comparatively rare. No great precautions appear to be taken against malaria ; mosquitoes have unlimited breeding-grounds in the lagoons and marshes of the coastlands, and are troublesome at most of the coast towns. It is said that the majority of foreigners go through an acclimatizing process of suffering from mild fever. In the Gulf States the malarial season sets in with the summer rains ; on the Pacific side this is not necessarily so, for in Guerrero, at any rate, the winter or dry season is regarded as the worst period for the more severe types of the disease. Indians suffer as much and as often as whites from malaria. The native not uncommonly develops the disease, owing to chill, on passing from the hot lands up to the plateau.

Yellow fever (*fiebre amarillo*) was formerly a scourge on the Gulf Coast, and appeared also on the Pacific side at Salina Cruz and elsewhere. Under the administration of Diaz a Board of Health was set up, established agents at seaports and elsewhere, and dealt more or less successfully with this and other epidemic diseases. At Progreso there were 70 deaths from yellow fever in 1906 and only 19 in 1909, since when no special mention is made of the disease. At Puerto Mexico it is almost unknown ; at Vera Cruz, so far as reports are available, there has been none since 1909 ; at Tampico,

since an epidemic in 1902-3, it does not appear to have been serious ; at Salina Cruz no case is reported since 1903. Yellow fever, however, is a mosquito-borne disease, and unless these insects are eradicated the risk of recurrence of the fever (especially if precautions are relaxed) is not absent. It is stated that men who are not seasoned by (say) three months' residence in the country may easily start an epidemic.

Among other diseases more specially characteristic of the coastlands, dysentery, intestinal troubles, and, among the poorer classes particularly, tetanus, are mentioned in reference to many towns ; these complaints, like others, are more or less intimately associated with the insanitary conditions in which the Indians and others of the lower classes live. Skin diseases are also common : leprosy is mentioned as occurring on the Pacific coast, where also, from the neighbourhood of Mazatlan to the Isthmus of Tehuantepec, a skin disease occurs called *mal del pinto*, from the coloration which it causes ; it is of unknown origin and is not infectious.

Common to the whole country are small-pox, typhus, and tuberculosis, while, among minor complaints, the natives are said to suffer much from influenza and rheumatism during the cold weather which accompanies the rains and Northerners ; this cold, even in the coastlands, is very severely felt owing to the high humidity. Pulmonary complaints are common in Mexico City and at the higher altitudes generally.

Small-pox, during the period 1898-1907, accounted for a mean annual number of deaths amounting to 21,614. It occurs equally in towns and in the country. In the period mentioned groups of States in the south-east and the north-west—Campeche, Chiapas, Tabasco, and Yucatan ; Colima, Sinaloa, Sonora, and Lower California—were most free of this disease ; the greatest absolute number of deaths occurred in a central group of States around Mexico City, and by far the worst epidemic was in Oaxaca in 1902. The Board of Health took measures against the disease, and succeeded to some extent in establishing vaccination, but in the remoter parts this is often neglected, and oftener done inefficiently. Moreover, precautionary measures have of late years been

relaxed, and it would seem that the disease is constantly liable to outbreak. Vera Cruz and Frontera, on the Gulf Coast, both had epidemics of it in 1915. Vaccination before a visit to Mexico is advised.

Typhus caused an average of 5,428 deaths annually in 1898-1907. There were definite epidemics of it in some States in certain years, as for example in Durango and Puebla, and in the Federal District. It is characteristic chiefly of towns, and of the temperate uplands more than of the coastlands; it is associated with insanitary conditions, and is conveyed by lice; and in the absence of proper regulation it is said to have been rife during recent years, to have been especially serious in the capital, and even to have caused the evacuation of villages and towns in Southern Mexico, though it is lately reported that government measures against it have met with some success.

Tuberculosis, formerly characteristic of the coastlands, and still especially prevalent in Vera Cruz, Mazatlan, and other coast towns, has spread to the uplands also. Venereal diseases are common. Among diseases occurring locally, mention is made of a particularly grave complaint called *Guadalajara dirrahora*, the origin of which is not definitely established.

Frequent references are found to the high mortality among infants and children, and to the general ignorance of the masses of the people concerning the prevention and treatment of disease.

FOREIGN CONSULS

The latest available list of foreign consuls, dated 1913, is given in the accompanying table and notes, in which the asterisks denote that consuls, vice-consuls, or consular agents of the countries named at the head of the table are stationed in the towns named at the side.

The British list, however, is corrected to Jan. 1, 1918. Great Britain has a Consul-General at Mexico City, Consuls at Colima, Ciudad Juarez, Progreso, Salina Cruz, Tampico, and Vera Cruz, and vice-consuls, pro-consuls, or consular agents at the other points indicated.

[illegible]

² Guaymas and Santa Rosalia.

¹ Merida and Progreso.

³ Colima and Manzanilla.

* In addition, there are consular representatives of Argentina, Brazil, Denmark, the Dominican Republic, Monaco, Nicaragua, Panama, Paraguay, Persia, Switzerland, and Uruguay at *Mexico City*; and of Brazil, Denmark, Panama, and Persia at *Vera Cruz*.

NEWSPAPERS

Liberty of the press is prescribed by the Constitution. All the more important newspapers are published (normally) in Mexico City; the provincial Mexican press is insignificant. The most important daily paper is *El Imparcial*, which used to have a circulation of 80,000–100,000. The daily press has been sharply divided recently between those journals which have supported the causes of the Entente and the Central Powers, respectively, in the war. *El Universal*, a morning paper, in 1917 conducted a campaign for the severance of diplomatic relations with Germany. *El Nacional* and *Courier de Mexique* (a French paper), both issued in the afternoon, are on the same side; on the other hand, German interests have been represented by *Democrata* (a morning paper primarily for the upper classes), *El Mundo* (morning) and *La Defensa* (noon), of a more popular order, and the afternoon papers, *La Rendicion*, *La Cauterio*, and *La Boletín de la Guerra*. *El Pueblo* and *El Excelsior* are morning journals which have been generally favourable towards the United States. Other daily papers of some importance are *El Diario*, *El Dictamen* and *La Vanguardia*, but the press has undergone much change during the revolutionary period, and it is not clear that all the journals mentioned hereafter have been regularly maintained.

Church papers, such as *El Tiempo* and *El Pais*, are (or until recently were) numerous and widely read. Bi-weekly journals of some importance were the anti-clerical *Paladin* and *La Tribuna*, Catholic. There were several journals for special interests, such as *Financiero Mexicana*, *El Heraldo Agrícola*, *El Boletín Judicial*, *El Gaceta*. Weekly journals of the higher class included *Artes y Letras*, *El Mundo Ilustrado* (issued from the office of *El Imparcial*), *El Seminario Literario*, and *Revista Literaria*. Humorous journals (not of a high order) have commonly a strong political bias.

The *Mexican Herald*, a daily paper in English, was formerly

well known as the principal organ of the English-speaking population ; there was also an evening paper called the *Daily Record*. An American daily paper has been issued in Monterey, and Americans established weekly papers in English in Guadalajara, Guanajuato, Oaxaca, and some other provincial cities with considerable English-speaking populations. A German weekly paper, *Deutsches Zeitung von Mexico*, is printed in Spanish, and German wireless news has been printed periodically in *Informaciones des Inalambricas*. *Modern Mexico*, a monthly journal in English, has from time to time contained topical articles of considerable value on industrial, commercial, and kindred subjects.

The following list, dated July 1918, names a number of official and other periodicals published in Mexico City, and not referred to above :—

Blake's Bulletin. Monthly.

Boletín de la Camara Nacional de Comercio. Monthly.

Boletín de Ingenieros. Monthly.

Boletín Minero. Bi-monthly.

Boletín Oficial de la Secretaria de Agricultura y Fomento. Monthly.

Boletín del Petroleo. Monthly.

Diario Oficial. Daily.

El Economista. Weekly.

Revista de Revistas. Weekly.

Tohtli. Monthly.

El Universal Ilustrado. Weekly.

El Universal Infantil. Monthly.

The following list of the same date names provincial periodicals :—

Boletín de la Camara Agricola Nacional Jalisciense. Guadalajara. Monthly.

Boletín de la Camara Nacional de Comercio. San Luis Potosi, and Vera Cruz. Monthly.

El Correo de la Tarde. Mazatlan. Daily.

Diario Oficial. Merida. Daily.

Gaceta Municipal. Guadalajara. Monthly.

El Informador. Guadalajara. Daily.

Oriente. Merida. Monthly.

Prosperidad. Monterey. Monthly.

Yucatan Escolar. Merida. Monthly.

According to a recent statement of the post-office department, there are 440 newspapers, magazines and periodicals in all, of which 137 are published in the capital. The total includes 81 dailies, 52 bi-weeklies and tri-weeklies, 180 weeklies and tri-monthlies, 85 monthlies, 33 bi-monthlies, and 9 publications of other periods.

APPENDIX I

GAZETTEER OF TOWNS

NOTE.—The following gazetteer contains accounts of (1) all State and territorial capitals, (2) other towns which on the information available appear to be of sufficient general importance: a standard of population has not been adopted. The distances are given from Mexico City by rail in miles (m.) unless otherwise stated. The altitudes (alt.) in feet above sea-level continually differ in different accounts; those given here accord, where possible, with the stated elevations of the railway stations. The populations (pop.) are so far as possible those of the census of 1910, but rounded, inasmuch as accounts of that census differ, and its results, for reasons given in Chap. III, cannot be regarded as closely reliable. It should be added that descriptions of the towns refer almost wholly to normal conditions before the revolutionary period.

For towns not included in this gazetteer, reference should be made to the index. For road-connexions, see Appendix II; for details concerning railways, Appendix III.

All towns dealt with in this gazetteer have connexion with the Federal telegraph system generally, unless otherwise stated.

Acambaro, State of Guanajuato, 177 m. NW. of Mexico City. Pop. 10,500. Alt. 6,036 ft. *Situation*: in agricultural district, among hills, on left bank of Lerma river, over which there is a large bridge. The town possesses a municipal palace, a market, and a hospital. The sanctuary of Guadalupe is one of the chief churches. *Industries* include fruit-growing. *Roads*: see Appendix II, Routes 66, 67. *Railways*: National. Junction for Uruapan line. The trains start from the main-line station, which lies about $\frac{1}{4}$ m. from the town. Railway workshops. See Appendix III, Sections xi, xii. *Water-supply*: an old aqueduct brings drinking water from the Jocuaro springs to the centre of the town. There is no electric light installation and no drainage system.

Acapulco, port, State of Guerrero, 320 m. ESE. of Manzanilla. Pop. 6,000, including many negroes but few Europeans. *Situation*: on Pacific coast on the north side of Santa Lucia Bay, which is western arm of Acapulco Bay.

The town lies on a narrow strand with hills to N. and a hilly peninsula about $\frac{1}{2}$ m. wide on W. separating it from the open ocean. It has several times suffered great damage from earthquakes, and in 1912 was practically destroyed by a hurricane, and is only partly rebuilt. In days of Spanish sovereignty it used to be chief port for trade with Philippines. Town is mean and crowded, with narrow streets. Buildings mainly of adobe and one-storied. Chief buildings are church, custom-house, market, town hall and gaol, but last three partially wrecked in 1912. Town is unhealthy, but efforts have been made to improve sanitary conditions. *Industries*: trade is dwindling owing to lack of railway communication with interior. *Exports*: sesame, coffee, hides, and fruit. Soap and oil factories and cotton mills, closed or on point of closing in 1915. *Roads*: see Appendix II, Routes 75, 78. *Railway*: construction work begun on line to Balsas, but ceased some years ago. *Electric lighting* plant operates from sunset to sunrise. *Water* brought into town in jars from wells in neighbourhood. Pacific Mail Co. had a tank in town. No sewerage works. *Supplies*: about 4,500 tons of coal used to be kept by three firms, but present stock doubtful. Lubricating oil plentiful. *Wireless station* opened in 1917.

Port.—No artificial harbour works. Three small piers, but vessels' cannot lie alongside. Two square miles of good sheltered anchorage available for the largest vessels. Supply of lighters ample. One tug. No cranes.

Aguascalientes, capital of State of Aguascalientes, 364 m. NW. of Mexico City.¹ Pop. 45,000. Alt. 6,280 ft. *Situation*: on level site among volcanic hills, on left bank of Aguascalientes R.; the surrounding country is very mountainous. There are hot springs in the neighbourhood, the most important being on the Ojocaliente *hacienda*, less than a mile from the town, and the place is noted for its baths. The climate is very mild, and the death-rate unusually low. The town is well built, with good public and private buildings; it is fairly compact, but only really closely built in the centre.

¹ Plan of Aguascalientes in case accompanying this volume.

The streets are from 30 to 40 ft. wide ; in the centre of the town there are good side-walks, but the road surface is bad ; and in the outskirts there are no side-walks, and the surface is worse. There is a hospital belonging to the railway, near the station, a military hospital recently established, an orphanage, and numbers of churches. The town stands on an extensive system of tunnels or catacombs, now used in some parts as wells or cesspools. *Industries* : principal distributing centre of State, with wool and cotton mills, tobacco factories, potteries, brewing and distilling. It is famous for its ' Mexican drawn-work ', and *sarapes* of mediocre quality are also made. Corn and beans are sent to Mexico City, and cattle, horses, and mules all over the Republic. The principal smelting plant of the American Smelting and Refining Co., with 3 Westinghouse engines of 100 h.p., is situated in the town. *Roads* : see Appendix II, Routes 29, 38, 46-49. *Railways* : Mexican Central, station about 1 m. from town. Also line to Tampico, via San Luis Potosi. Railway shops (see Appendix III, Section vi). *Tramways*, electric, give a satisfactory service, running at frequent intervals and connecting with various suburbs. The tramways have a separate electric powerstation. *Electric light*, by alternating current, generated at 2,200 volts, and transformed down to 110 volts by transformers on poles in the streets. The power station of the company is in the outskirts of the town. *Water-supply*, by gravity, from municipal water-works, supplied from a spring in the suburbs. The water passes through a reservoir, and thence by a closed conduit to a tank about 35 ft. above the level of the business district, whence it is piped to the town. There are a few hydrants in the streets, but they are difficult to find. The pressure is poor, and the supply sometimes short, the deficiency being due to the pipes, not to the spring.

Alvarado, port, State of Vera Cruz, 43 m. SE. of Vera Cruz. Pop. 5,000. *Situation* : on west side of channel connecting Laguna de Alvarado with the Gulf of Mexico, $1\frac{1}{2}$ m. from the sea, at the extremity of a narrow, bare, sandy peninsula. The town is an old-fashioned place, which has not been

modernized, so far as is known, in any respect. *Industries* : trade in cedar, mahogany, fustic, cattle, &c. ; fisheries in the lagoon. *Road* : see Appendix II, Routes 130, 131. *Railway* : Vera Cruz Railway, to Vera Cruz ; reported in 1917 to be out of working order as a result of damage during recent disturbances. See Appendix III, Section xxiv. *Port* : approached over a shifting bar with depths of 10–14 ft. Wharves, a machine shop, and a mechanical slip for small vessels are reported to have been recently destroyed or damaged. Alvarado is of more importance for inland than for marine navigation. The main river routes are by the rivers Papaloapam, Tesechoacan, San Juan, and San Agustin and the principal centres on these are Tlacotalpam, Chacaltianquis, Tuxtepec, Playa Vicente, San Juan Evangelista, Palo Herrado, and Alonzo Lozano (for San Andres Tuxtla and Santiago Tuxtla) ; see p. 26. The river fleet, recently sold by the Vera Cruz Railways Company, a British concern, included a twin-screw steamer of 350 tons capacity, some 15 other steamers, mainly stern-wheelers with a load draught of 3 ft. 6 in., a sea-going steel towing barge of 100 tons capacity, and a fleet of sailing ‘canoes’ on the upper reaches of the rivers.

Amecameca, State of Mexico, 32 m. SE. of Mexico City. Pop. 14,000. Alt. 7,600 ft. *Situation* : at base of Ixtaccihuatl and Popocatepetl Mts., for the ascent of which the town is the usual starting-point. It is surrounded by maize fields. The town is scattered, and was a very large Indian settlement before the conquest, many remains being found. There are several ancient churches, and close to the railway station is the Sacro Monte, a hill some 400 ft. high, with a small church built over a hermit’s cave on the summit. Numbers of Indians come here on pilgrimage on Ash Wednesday. *Industries* : cotton mills, distilling and brewing. *Railway* : Interoceanic, Cuautla–Los Reyes line. See Appendix III, Section xix.

Atlixco, State of Puebla, 162 m. SE. of Mexico City. Pop. 20,000. Alt. 5,531 ft. *Situation* : in wide and fertile

valley of Atlixco, where wheat and maize are grown. The climate is very fine. The ancient town is surrounded by orchards; to the N. of it lies the hill of San Miguel, with a chapel on the summit. There is a hospital. *Industries*: large cotton factories, in particular that of the Atlixco Industrial Co., and flour mills. *Railways*: Interoceanic, Puebla-Cuantla line. Branch line, San Rafael and Atlixco Railway. See Appendix III, Section xviii. *Tramways*, running to station.

Campeche, port, and capital of the State of Campeche, 107 m. SW. of Merida by rail (no railway connexion with Mexico City). Pop. 16,800. *Situation*: on western coast of Yucatan Peninsula (Gulf of Mexico), in a picturesque position, backed by low hills up to 320 ft. high, which here recede slightly from the coast and enclose a small plain. The city was formerly of much greater relative importance than it is now, and the seventeenth-century forts and bastioned walls, 8 ft. thick, of which segments are still standing, the good public buildings, and the comfortable stone houses, indicate its former wealth. It is regularly laid out with shady squares and streets, and is entered by four gates in the old walls. The principal square, in the centre, is the Plaza de la Independencia, and the main thoroughfare is the Calle de Baranda. The streets are uneven, badly paved, and rather dirty, and the side-walks are narrow and irregular. Principal buildings include the church of San Jose in the centre, the square tower of which serves as a lighthouse, the town hall, theatre, library, and Instituto Campechano, with museums of natural history and archaeology. The town is built over immense catacombs constructed by the ancient Maya inhabitants. Hospital in south-west quarter. The town is by no means the healthiest on this coast. *Industries*: export trade in logwood, dye-woods, hemp, salt, hides, &c. Tobacco is grown; small manufacture of cigars. Market well furnished with stock and vegetables. *Road*: see Appendix II, Routes 134 A, 135. *Railway*: line of Constitutionalist (United) Railways of Yucatan to Merida; thence to Progreso and

other points in Yucatan. See Appendix III, Section xxxii (b). *Tramways*: two lines in town, one to Lerma, a fishing village 4 m. SW., and one to inland villages; animal traction. *Electric lighting*. *Wireless telegraph station* (see p. 183). *Cable* to Frontera, &c. *Water-supply*: a few springs, poor water. Rain-water is collected in tanks and drinking-water is distributed in carts; visitors are warned against it unless it is boiled.

Port.—An open, shallow roadstead; the 3-fathom line is over 10 miles off shore, and vessels drawing 10 ft. can only approach, in fine weather, to about 4 miles from the town. Small pier about 150 ft. long for lighters; heavily laden boats cannot lie alongside with very low tides.

Cananea, State of Sonora, 1,507 m. NW. of Mexico City. Pop. 18,000. Alt. 5,270 ft. A modern mining town; the population, which is largely of a floating character, includes many American miners. Many of the houses are primitive. The town is divided into three parts, the East Mesa (tableland) where the hotels, railway station and many private houses are situated; the south Mesa, a high hill known also as Old Cananea, and covered with small wooden huts; and Ronquillo, in the hollow, where are the main street, the post office, and the reservation of the Cananea Consolidated Copper Co., which contains good houses, no building being permitted without the consent of the Company. There are many mining camps on the neighbouring hills, and in the valleys, including those of Chivatera and Puertecitos, and a large smelter on the hill behind the reservation. The camps are connected by good roads, cut out of the mountain sides. *Industries*: important copper-mining district; chief company, the Cananea Consolidated Copper Co. The Cananea Cattle Co. has its head-quarters in the Plaza Principal. *Railways*: Southern Pacific. Station on East Mesa. A line belonging to the Copper Co. connects the mines. See Appendix III, Section ii. No Federal telegraph connexion. *Water-supply*, piped from a good spring.

Carmen (Laguna), port, State of Campeche, about 100 m.

SW. of Campeche and 180 m. E. of Puerto Mexico by sea. Pop. 7,000. *Situation*: on the Gulf Coast, at western end of Isla del Carmen, a low sandy island 20 m. long and 2 m. wide, which fronts Laguna de Terminos, a shallow lagoon 40 m. long and 17 m. in extreme width, with low, swampy, forested shores. The town is laid out with straight streets, the chief of which are Calles del Comercio and Principal. Building is mostly of timber, bricks and tiles. Hospital. The climate is hot and the place unhealthy. *Industries*: export trade in mahogany, logwood, chicle, cedar, fustic, hides, rubber, and coco-nuts. Fisheries. Market well supplied with meat and vegetables. *Road*: see Appendix II, Route 134 A. *Tramway*, animal traction (?). *Lighting* by oil lamps. *Water-supply*: pumped from spring at north end of town.

Port.—In the western and deeper entrance to the lagoon (Barra Principal). Vessels over 13 ft. draught anchor outside the entrance, an unsafe position during the season of northers, but the inner anchorage is sheltered. A number of small moles along front of town, extending out from shore, with 13–18 ft. depth alongside; the principal is the customs-house mole at the outer end. Laguna de Terminos receives a number of rivers, and Carmen is a centre for their navigation; the chief of them are the Mamantel, Candelaria, Chumpan, and Palizada, which gives access to the Usumacinta and the system of rivers which discharge through the Grijalva at Frontera (which see: for the inland navigation see also p. 26).

Catorce or Real de Catorce, State of San Luis Potosi, 435 m. N. of Mexico City. Pop. 40,000, in town and mining district, when the mines are in full work, but said to be only 3,000 in 1911. Alt. 9,070 ft. *Situation*: on slope of precipitous mountain, in centre of very rich silver-producing region. The streets are narrow and precipitous, and there are no wheeled vehicles in the town. *Industries*: mining and associated occupations. *Railway*: National. See Appendix III, Section vii. Station 8 m. away, about 1 m. from foothills, whence there is a steep trail to town. *Tramway*:

from lower side of Catorce to Santa Anna mine, passing Dolores Trompeta mine.

Celaya, State of Guanajuato, 181 m. NW. of Mexico City. Pop. 23,000. Alt. 5,763 ft. *Situation*: in beautiful and fertile Bajío, an extensive plain on the central tableland, 2 m. from the Laja river. The town covers an area of about $\frac{1}{2}$ square mile, and is closely built; the streets are usually from 30 to 40 ft. wide. The chief business quarter is in and near the Plaza Mayor, and there are many large and notable buildings, several the work of Tresguerras, who was born and died here. Chief among these are the church of Nuestra Señora de Carmen (one of the most famous churches of Mexico), the parochial church of San Francisco, that of San Agustín, and the bridge across the Laja. There is a good market. Hot springs on the neighbouring Moralitos *hacienda*. *Industries*: the prevailing trade is agricultural. Corn, wool, and cotton mills; soap, alcohol, and hat factories, tanneries. Large quantities of a popular sweetmeat, known all over the Republic as Celaya *dulce*, are made here. *Roads*: see Appendix II, Routes 28, 61, 67, 68. *Railways*: junction on National and Mexican Central; station more than a mile from town. See Appendix III, Sections vi, xi. *Tramways* (animal traction) run to the station, and to Roque, Yustis, Plancarte, and Santa Cruz. *Water-supply* is from artesian wells, from which it is distributed in clay receptacles to the houses by hand. It is also pumped from a well to an iron cistern in the centre of the city, at a height of about 100 ft. above its level. There is a hydrant at the corner of each block. It is not clear how much of the town is supplied with water by this means.

Chihuahua, capital of State of Chihuahua, 1,000 m NW, of Mexico City.¹ Pop. 39,000. Alt. 4,605 ft. *Situation*: on level site in valley surrounded by low volcanic hills, on the Chubiscar river which runs past the W. side of the town. The district is agricultural, and large quantities of minerals are mined in the hills. The town is fairly closely built, and

¹ Plan of Chihuahua in case accompanying this volume.

covers an area of roughly 2 m. by $1\frac{1}{4}$ m. ; the newer part is well and regularly laid out, but the older, which comprises the business quarter, is somewhat irregular. The material of which the older houses is built is said to contain a large percentage of silver ore. The streets vary in width from 35 to 50 ft., and the paving and road surfaces are above the average. There are a number of good buildings ; the municipal palace and the Government palace lie close together on the W. side of the town, the hospital in the N., and the penitentiary in the S. ; the cathedral, with a good view from its towers, faces the Plaza de la Constitucion. The chief business streets are the chief Plaza, and the Calles Aldama, de la Libertad, and de la Victoria. *Industries* : distributing centre for large mining, agricultural and cattle-raising district. There are a corn-mill, brewery, and cotton-mills in or near the Avenida Juarez, with railway shops, a foundry and a corn-mill on the other side of the river. There are also hat and candle factories, &c. *Roads* : see Appendix II, Routes 13, 15, 16, 17. *Railways* : Mexican Central ; station on the E. side of the town, $\frac{1}{2}$ m. from Plaza Mayor. Mexican North-Western, and Kansas City, Mexico and Orient ; joint station to S. of the town. The Chihuahua Mineral Railway connects the town with Santa Eulalia, 17 m. to the SE. ; station to the N. of the town, near the Mexican Central station. See Appendix III, Sections vi, iv, v. *Tramways* : animal traction. *Wireless* telegraph station. *Electric light*, by alternating current, generated at high pressure, and transformed down by transformers on poles in the streets. The electric light station is to the W. of the town, on the other side of the river. *Water-supply* : municipal, by gravity from the Chubiscar river on which an impounding dam has been built, $3\frac{3}{4}$ m. from the town. Thence the water passes through $2\frac{1}{2}$ m. of masonry conduit to 2 tanks at an elevation of about 65 ft. above the level of the business district. The supply is constant and practically unlimited, but the pressure is poor, particularly in the upper parts of the town. There are hydrants, one to each block, in all the principal streets.

Chilpancingo, or Ciudad Bravos, capital of State of Guerrero, 233 m. S. of Mexico City. Pop. 7,500. Alt. 4,527 ft. *Situation*: in a fertile valley in a highly volcanic region of the Sierra Madre, on the banks of the Huacapa and Apatzingo rivers. There are many fine orchards round the town, which formerly contained many old and beautiful buildings, which have largely been destroyed by earthquakes. To the NW. there are extensive Indian ruins, and many gold and silver ornaments have been dug up. The town has a Government palace. *Industries*: fine palm hats and mats are made in the neighbourhood. *Railway*: Cuernavaca line of the Mexican Central runs as far as Balsas. See Appendix III, Section xxii. Chilpancingo is reached from Iguala, the nearest large town on the railway (87 m. N. of Chilpancingo, and 34 m. N. of Balsas), by a fair road (Appendix II, Route 75 A. For other roads, see Routes 76, 82). *Electric light* is installed in the town.

Ciudad Juarez or Paso del Norte, State of Chihuahua, 1,225 m. NW. of Mexico City. Pop. 7,000. Alt. 3,800 ft. *Situation*: in flat alluvial country, with low hills to W. District entirely agricultural and stock-raising. Frontier town and almost a suburb of the thriving city of El Paso, Texas, from which it is separated only by the bed of the Rio Grande, generally dry, and crossed by a bridge. The population is increased by numbers of Chinese, who await an opportunity to cross into the U.S.A. The area of the town is small, and it consists mostly of one street; in appearance it resembles the Texas towns. The chief business centre is the Calle Comercial. The custom house is near the railway station. *Industries*: mining centre. The town owes its existence to its position as the frontier town of the railway, and trade is largely dependent on the tourist traffic from El Paso. Cotton and corn mills, cloth factories. *Road*: see Appendix II, Route 12. *Railways*: Mexican North-Western. The line crosses the river by a separate bridge near the road bridge. Also a junction for the Central line. See Appendix III, Sections v, vi. *Tramways*, electric; International

Street Car Line operates a frequent service to El Paso, with a customs examination at the end of the bridge. *Electric light*, with a power station in El Paso. *Water-supply*: from a tank, situated in the highest part of the town and 80 ft. above it, which is filled by pumps from an artesian well. There are hydrants along the Calle Comercio, and at a few other points. The El Paso fire brigade, which is well equipped, crosses the river if required.

Ciudad Victoria, capital of State of Tamaulipas, 811 m. N. of Mexico City. Pop. 18,000. Alt. 990 ft. *Situation*: in semi-tropical, agricultural country, on the l. bank of the San Marcos river (which runs to the S. of the town), in a fertile valley. To the S. is Mt. Muerto, and to the W. the steep slopes of the Sierra Madre. The town is surrounded by orchards and orange groves, and is a quiet place, with a few large business houses. Its development has been arrested by epidemics of yellow fever. *Industries*: centre for the ixtle fibre produced in the Jaumave Valley. *Roads*: see Appendix II, Routes 108, 110–113. *Railway*: Mexican Central, Monterey–Tampico line. See Appendix III, Section ix. *Tramway*: animal traction, to Tamatan *hacienda*. *Water-supply*: by canals from the river.

Colima, capital of State of Colima, 546 m. W. of Mexico City. Pop. 25,000. Alt. 6,000 ft. *Situation*: in fertile valley, on gentle slope watered by Colima and Manrique rivers, and at foot of an active volcano, Mt. Colima. Surrounding country mainly agricultural, with a few unimportant manufactures. Fever is endemic, and diseases of the pulmonary and digestive organs common. Town is noted for its tropical aspect, with many gardens and palms. The buildings have mostly low-pitched tiled roofs; the town is somewhat irregularly planned, and the streets are narrow but clean. The road surfaces are cobbled; the side walks are good. The cathedral, with twin towers and a dome, adjoins the Government palace, facing the Plaza de Armas. There are several hospitals, including a modern military hospital, a good market, and a theatre. *Industries*: supply of necessities to the surrounding district

a considerable trade, and various local industries, such as hat, cigar, and oil factories, the making of sweetmeats, and cotton mills. *Roads*: see Appendix II, Routes 34–37. *Railway*: Mexican Central, Guadalajara–Manzanilla line. See Appendix III, Section xxviii. *Tramways*: electric, run in the town and to the suburban village of Alvarez, which is noted for its beautiful houses and palms. *Electric light*, with a plant 12 m. away in order to utilize the power of a waterfall. The current is transmitted at high pressure, and transformed down by transformers on poles in the streets. *Water-supply*: from springs, very small, for domestic purposes only. The poor people use the water of the Colima river.

Comitan, State of Chiapas, 700 m. SE. of Mexico City. Pop. 10,000. Alt. 5,314 ft. *Situation*: in the fertile plain of Comitan, near Blanco river. The town has a municipal palace and a hospital. Many of the people are mechanics and carpenters. *Industries*: centre of large trade in sugar and cattle, particularly with Guatemala, and noted for the manufacture of *comiteco*, a brandy made from an agave plant, resembling maguey; wool mills. The town is reached by road from Jalisco and is 62 m. by a good road from San Cristobal de las Casas (see Appendix II, Route 97). *Electric light* installation, but no drainage system or water-supply; the water in use is deficient both in quality and quantity.

Cordoba, State of Vera Cruz, 198 m. E. of Mexico City.¹ Pop. 10,000. Alt. 2,713 ft. *Situation*: on a small hill called Xitango, in the fertile basin of Seco river on the lower slopes of the range between Mexico City and the Gulf coast. The surrounding district is agricultural. The town, which stands on an almost level site, is irregularly built; it is said to be unhealthy. Many of the houses are of the old Spanish type, but there are none of adobe, since they could not withstand the heavy rainfall; the house-roofs are usually low-pitched and tiled, with projecting eaves. The streets, which are from 30 to 40 ft. wide, are cobbled; the road-surfaces are

¹ Plan of Cordoba in case accompanying this volume. This town, by a recent report, appears to have become the State capital (but see *Orizaba*).

very bad, and there is hardly any wheeled traffic in the town, except the trams. The principal business district lies N. and S. of the chief Plaza, and includes the W. end of the Calle Principal. There is a municipal palace in the chief Plaza and a market, and a good hospital. *Industries*: centre of tobacco, coffee, sugar and fruit-growing region, to which the town supplies necessities. Cotton and wool mills, and the factory of the Mexican Sugar-Refining Co., employing electric power. *Roads*: see Appendix II, Routes 125 B, 128. *Railways*: Mexican, Mexico City-Vera Cruz line. Station 1 m. from town. Branch line, Cordoba-Coscomatepec. See Appendix III, Section xxiii. *Electric light*: small supply. No generating plant, only a transforming station, in town. *Water-supply*: from Tliapa river. The water is impounded by a dam, and carried by steel and earthenware pipes to the town. There is a second large tank, providing 4 or 5 days' supply in the event of interruption of the conduit from the intake. The main from the clean-water tank crosses the Antonio river by a steel syphon. The supply is constant, and is largely increased at the time of the melting of the snows on Mt. Orizaba. There are hydrants at frequent intervals in the town.

The Indian village of AMATLAN, where the people jealously preserve their traditional customs, lies 3 m. to the SE.

Cuernavaca, capital of State of Morelos, 74 m. S. of Mexico City.¹ Pop. 12,600. Alt. 4,500 ft. *Situation*: on long, narrow ridge, in the picturesque country watered by the Tepeyete river. Fine climate, and the town has a considerable reputation as a health resort. The Health Council are careful in the avoidance of epidemics. It is a picturesque old place, with narrow, tortuous streets, cobbled but clean, many trees and flowers, and numerous streams. The seat of the State Government is in the ancient Cortes palace, which faces the Plaza de Congresso, on a shelf of land which falls away steeply. There is a busy market near this Plaza, and a formal garden, the Borda Garden, to the W. of the town.

¹ Plan of Cuernavaca in case accompanying this volume.

Near it is the cathedral, one of the oldest buildings in the Republic, also standing on an abrupt slope which overlooks the lower part of the town. Theatre and several hospitals. *Industries* : agricultural centre. Trade is local and unimportant. Sweetmeats and quince wine are made, and pottery in the suburbs of San Antonio. Brewing and tanning. *Roads* : see Appendix II, Routes 75 A, 84, 85 B. *Railway* : Mexican Central. See Appendix III, Section xxii Station over a mile NE. of town, and connected with it by a winding road. *Tramways* : animal traction, run to station. *Wireless* telegraph station. *Electric light* installation. *Water-supply* : partly from subterranean springs of El Parque, about 1 m. from the town, whence it is carried by masonry conduits to an old aqueduct running to the upper part of the town. This water has a laxative tendency. There is also a supply from a spring in Miraval.

The colony of MIRAVAL lies to the N. of the town, and the village and falls of SAN ANTONIO to the NW. TLALTENANGO, a village 3 m. to the SW. and reached by an old and much-frequented road, has an interesting church with a miraculous image. Near the Indian village of TEPOZTLAN, 9 m. from the town, are the ruins of the *teocalli* of Tepoxtepec. Those of XOCHICALCO lie on a hill, commanding fine views, near the village of the same name, 18 m. to the W. of Cuernavaca ; 30 m. to the SW. are the Cacahuamilpa caverns, the largest in Mexico, near the village of CACAHUAMILPA.

Culiacan, capital of State of Sinaloa, 896 m. NW. of Mexico City. Pop. 13,500. Alt. 275 ft. *Situation* : on level site, in centre of a wide valley between the Sierra Madre and the sea, at the confluence of the Culiacan and Humaya rivers, with low hills to the N. and E. about 5 m. distant. The country is mainly agricultural, with some mining towards the mountains. The town is built along the river banks, and the buildings are mostly of brick, with flat roofs in the centre and better-class district, and low-pitched tiled roofs in the outskirts. The streets are about 40 ft. in width, and the road surfaces very bad. The Plaza de Rosales and Plaza de la

Constitution are tropical in appearance; the latter has arcades on three sides, with the cathedral and a seminary on the fourth. There are Government and municipal palaces, and a private hospital. *Industries*: distributing centre for the district. Trade is not important; the few local industries include a sugar refinery, alcohol factory, and cotton mill. *Roads*: see Appendix II, Routes 9, 10. *Railways*: Southern Pacific. Also branch (Occidental Railway) to port of Altata, 38 m. away. Station $\frac{3}{4}$ m. from town. See Appendix III, Section i. *Electric light*, by alternating current; transformers on poles in the streets. *Water-supply*: small, with poor pressure, for domestic use.

Dolores Hidalgo, State of Guanajuato, 242 m. NW. of Mexico City. Pop. 7,000. Alt. 6,214 ft. *Situation*: in valley of Laja river in rich agricultural country. The town is called after Hidalgo, who was born and lived here, and his house is visited by many pilgrims. There is a large patriotic *fiesta* in September. There is a monument to his memory in the Jardin Independencia. Close by are the large parochial church, and the church de la Saletta. *Industries*: local manufactures of wine, brandy, sweetmeats, *sarapes*, &c. Flour-mill. *Roads*: see Appendix II, Routes 39, 62. *Railway*: National, Laredo-Mexico City line. Station 3 m. from town. See Appendix III, Section vii. *Tramway*, to station. *Electric light* installation. *Water-supply*: piped; unsatisfactory.

Durango, capital of State of Durango, 863 m. NW. of Mexico City.¹ Pop. 31,000. Alt. 6,209 ft. *Situation*: on level plain among the foothills of the Sierra Madre, at foot of the Cerro de Mercado, on the Tunal river. Hills to the W. and NW., and to the N. the famous Iron Mountain. The district is a mining and agricultural one of no great importance. The climate is very fine. The town is notorious for the numbers of scorpions found, whose bites cause 30 to 40 deaths each year. It covers an area of about $1\frac{1}{2}$ square miles. There are some modern reinforced concrete buildings

¹ Plan of Durango in case accompanying this volume.

in the centre, and the town is closely and regularly built, with streets from 50 to 60 ft. wide, but very badly paved. The chief streets are the Calles de la Constitucion, Teresas, Mayor, and Principal. The cathedral, a massive building with two square towers, is in Calle Mayor, the Government palace in Calle Principal, and the municipal palace in the Plaza de la Constitucion. There are a number of churches, a market, penitentiary, hospital and almshouses. The town is strongly Roman Catholic. *Industries*: trade is dependent on the surrounding mining and agricultural country and the lumber industry. Flour, wool and cotton mills, and a foundry near the Iron Mountain. *Roads*: see Appendix II, Routes 10, 11, 17, 19-24. *Railway*: International. Station in northern outskirts of town. See Appendix III, Section viii. *Tramways*: animal traction. *Electric light* installation, and drainage system. *Water-supply*: from a stone reservoir on the Cerro de los Remedios, on the SW. outskirts of town. The water is carried into the reservoir by a steam-driven pump, and the pressure in the mains is about 65 lb. Hydrant to each block in the town.

El Oro, or Real del Oro, 108 m. NW. of Mexico City. The boundary between the States of Mexico and Michoacan passes through the camp. Pop. 35,000. Alt. 9,500 ft. *Situation*: in a dip among hills. The town is picturesque but untidy. The streets are narrow, irregular and hilly, and many of the houses rough timber constructions. The people are of a low class, and the sanitary conditions very bad, but epidemics are checked by the high altitude. *Industries*: rich and well-known gold and silver mining centre. Chief companies are the El Oro Mining and Refining Co. and the Esperanza Mining Co. The power is mostly derived from the central plant of the Mexican Light and Power Co. at Necaxa Falls, 75 m. away. *Railway*: narrow-gauge line from Tultenango, 7 m. distant, on the National line, Acambaro-Mexico City. Line is the property of the El Oro Mining Co. and continues to Yondese (23 m.) where the timber lands of the company are situated. See Appendix III, Section xi. No

connexion with Federal telegraph system. *Water-supply* unsatisfactory.

Ensenada de Todos Santos, port, territory of Lower California, on Pacific coast, 60 m. by sea from United States frontier. Pop. 1,000 to 2,000. *Situation*: in shelter of Ensenada Point on NE. of Todos Santos Bay, on flat ground near sea-level, backed by low arid hills. Town is laid out on rectangular plan; all buildings new and most of imported timber. *Industries*: trade with U.S.A. in minerals, hides, cattle, and wine. Tannery, flour mill and fruit-canning establishment; all reported closed in 1914 on account of revolution. *Road*: a sandy track N. to San Diego, U.S.A., and another S. to San Quentin Bay. *Electric lighting* owned by private firm. *Water-supply* from wells in town; reservoir on hill behind town. Coal and oil are not obtainable, and wood is scarce.

Port.—Anchorage in 3–5 fathoms about a mile from the town, sheltered from north but fully exposed to south. Few facilities for handling cargo. Pier, 666 yds. long, damaged and probably not repaired. Wharf and breakwater begun in 1913 by a Canadian firm, but work is at a standstill. Small number of lighters. No cranes.

Fresnillo, State of Zacatecas, 475 m. NW. of Mexico City. Pop. 6,000. Alt. 7,344 ft. *Situation*: on a plain with hills to the N., W., and S., rising gradually towards the N. in a mining, agricultural, and cattle-raising district. The town is of much less importance than formerly. To the S., less than a mile distant, is Mt. Proano. Municipal palace, hospital, and theatre. *Industry*: gold-mining. Chief company is the Fresnillo Mining Co. The richest mines are those of Plateros, Minillas, and Proano: the latter was deserted, owing to flooding, in 1910. *Road*: see Appendix II, Route 19. *Railway*: Mexican Central. See Appendix III, Section vi. Station 6 m. from town, by very dusty road. *Tramways*: animal traction, run to station, passing Proano mine.

Frontera, port, State of Tabasco, about 120 m. ENE. of Puerto Mexico. Pop. 5,500. *Situation*: on right (east)

bank of Grijalva River 5 m. from its mouth, in low forested country intersected by creeks running to the river; below the town there are lagoons on either side of the river. The town has many well-built houses, but the streets are sandy and rough. It is normally not unhealthy as compared with other Gulf ports, but in 1915 there was an epidemic of small-pox, and malaria and intestinal complaints were rife, while the temporary quartering of troops in the town left it in an insanitary condition. Hospital. *Industries*: export trade in bananas, mahogany, rubber, hides, coffee, chicle, limes, and other tropical fruits, coco-nuts, &c. Cereals, excepting wheat, are cultivated, and cattle are reared, in the locality. Ship-building (see below); ice factory; manufacture of sweetmeats from tamarind pulp; market. *Electric lighting*. *Cable* to Campeche, Vera Cruz, &c.

Port.—Frontera is the principal port of entry for Tabasco State. The Grijalva River, though 40 ft. deep along the eastern bank, has a bar with 8–11 or 12 ft. depth only, and vessels exceeding 800–1,000 tons anchored outside, and discharged into and loaded from lighters. The construction of the Grijalva Canal was therefore undertaken, taking off from the river westward about $1\frac{1}{2}$ m. S. of the mouth, and cutting through a low tongue of land to the sea. It is about 160 ft. wide, and the depth intended was 20 ft., but the work of construction has been interrupted, and it is doubtful if this depth has been secured. At the north side of the canal mouth a jetty extends about 1,230 ft. from shore, and another is planned on the south side; just above the river end of the canal there is a jetty about 1,640 ft. long, extending slantwise downstream, and leaving a passage past its head about 1,150 ft. wide. Shipping facilities at the town are inadequate. There is a wharf 195 ft. long and 65 ft. wide, and there are others smaller; a dockyard and additional wharves have been planned. There are two small shipyards.

The inland navigation for which Frontera is the centre is extensive, the system embracing the River Grijalva and its tributaries the Tabasquillo, Usumacinta, Chilapa, and others

(see p. 26). These rivers form the most important lines of communication inland. For the river traffic there were at Frontera in 1916 3 steam tugs, 28 gasolene tugs and launches, 7 shallow-draught river steamers (total capacity 630 tons), 50 lighters of various capacities, and several hundred native *cayucas*. These vessels, excepting the native craft, are in great part of American construction, and the local navigation interests are largely American.

Gomez Palacio, State of Coahuila, 709 m. NW. of Mexico City. Pop. 14,000. Alt. 3,723 ft. Town is about $\frac{1}{2}$ m. square, and is closely built, with streets generally 60 or 65 ft. wide. The Calle Ferrocarril, which separates the soap-factory and railway workshops from the town, is 150 yds. wide. The shops are in this street and the Calles Independencia and Centenario. *Industries*: town is practically dependent on the soap factory of the Cia. Jaboneria de la Laguna, the Amiestad cotton mill, and the railway workshops. There are also a flour mill, and boot, rubber (guayule), and *sarape* factories. *Road*: see Appendix II, Route 25. *Railways*: Mexican Central. Passengers can change for Monterey, on the International, though it is more usual to go on to Torreon, the starting-point of the other line. See Appendix III, Sections vi, viii. *Tramways*: to Lerdo and Torreon. *Electric light*, with a generating station in the town. *Water-supply*: from artesian wells. No public pressure supply. The soap and cotton factories are supplied from a reservoir on a neighbouring hill, at a pressure of 90 lb. They have their own hose and hydrants to deal with fires.

Guadalajara, capital of State of Jalisco, 385 m. W. of Mexico City.¹ Pop. 119,000. Alt. 5,551 ft. *Situation*: on ground sloping gently from W. to E. with low hills to N., E., and S. One of the finest, cleanest and healthiest of the Mexican towns: the people, descended from the Spanish nobility who originally colonized the city, are better educated and more industrious than most Mexicans, and the difficulty of procuring *pulque*, which is little produced in Jalisco, is

¹ Plan of Guadalajara in case accompanying this volume.

a great benefit to the city. The city is closely and regularly built, and resembles the towns of Southern Spain. The climate is good, and the place is known as a health resort for tuberculous cases. There are a number of good modern buildings, including some of steel frame construction, and several modern suburbs, consisting of large houses with gardens, surround the town. The streets are of uniform width, from 40 to 50 ft. ; in the centre they are well paved, mostly with asphalt, but in the outer parts the road surfaces are of earth, and are in bad condition. In the intermediate districts the streets are mostly cobbled. There is an unusually large number of small squares, and many churches, Guadalajara having a reputation for religious observances. The chief shops are in or near the Plaza Mayor, and the Calles de San Francisco and Benito Juarez. The chief Plaza, called Mayor, de la Constitucion, or de Armas, near the centre of the town, is flanked by the Government palace, and the huge cathedral, with its pyramidal towers, 200 ft. high, which command extensive views ; it contains Murillo's picture of the Assumption of the Virgin. The E. and N. sides of the Plaza are lined by arcades (*portales*) where sweets, fruit, &c., are sold. Other important churches are those of Santa Monica (in Calle Santa Monica), San Francisco (at the junction of Calle San Francisco and Calle del Nuevo Mundo), El Carmen (in the Plaza del Carmen), Santuario de San Jose de Gracia, Templo de San Agustin, &c. There is a fortress-like penitentiary (in the west central district), a large hospital, with an orphanage, almshouse and girls' training school (in the east central district), and the Teatro Degollado (in Plaza de San Agustin). To the S. of the city is the Agua Azul Lake, in a park. *Industries* : Guadalajara has considerable natural advantages in its position as regards the chief Pacific coast markets and its easily utilized water-power, and it is far enough from the capital to be an important independent trade centre. It is in a rich agricultural and manufacturing centre, and is not dependent, like many Mexican towns, on mining activities. The manufactures in the city itself are not very important,

and are mainly for local consumption ; they consist in flour and cotton mills ; sugar and alcohol, soap, shoe, cement, biscuit, hat and *rebozo* factories ; breweries, brass-works, saw-mills, &c. Necessities, particularly machinery, are distributed to the busy surrounding districts. *Roads* : see Appendix II, Routes 27-33, 35. *Railways* : Mexican Central, Irapuato-Guadalajara line. The line to Colima and Manzanillo starts here, and also the branch to Ameca, and the Ramal de San Marcos, which leaves the Ameca line at La Vega for San Marcos. The station is at the end of the Calle de San Francisco, 5 min. walk from the centre of the city. See Appendix III, Sections xxviii, xxix. *Tramways* : electric, provide a good and cheap service in the city, and to the suburbs. They are worked by the Guadalajara Tramways, Light and Power Co. which is owned by the Chapala Hydro-Electric and Irrigation Co. *Wireless* telegraph station reported in construction, 1917. *Electric light* : high tension mains, carrying a pressure of 20,000 volts, run overhead through the city, from the power station of the Tramways, Light and Power Co. about 7 m. away, at the Juaracatlan water-fall, but are liable to interruption. *Water-supply* : municipal, derived from 5 different springs, connected by pipes and galleries. The water is collected at the electrical station of Los Colonos, about 5 m. from the centre of the city, where there are 2 reservoirs with pumps worked by electric power. The first distributing tank to which the water is pumped is outside the city, about 180 ft. above the business district. There is a hydrant to each block in the principal streets. The supply is fairly constant, but the pressure is poor.

ZAPOPAN, about 40 min. by tram from Guadalajara, has a fine old church. **SAN PEDRO TLAQUEPAQUE** (pop. 4,500), also connected by tramway, lies 3 m. E. of Guadalajara on the summit of a hill, and is a favourite summer resort. Well-known potteries.

Guanajuato, capital of State of Guanajuato, 253 m. NW. of Mexico City.¹ Pop. 35,000. Alt. 6,600 ft. *Situation* :

¹ Plan of Guanajuato in case accompanying this volume.

in narrow valley of Guanajuato river, which runs through the town, in mountainous and volcanic country above the great plateau, surrounded by steep and barren hills, falling away to the SW. The situation is healthy but exposed to winds. Guanajuato is one of the oldest and richest towns in Mexico. It covers an area of about 1 m. by $\frac{3}{4}$ m. and is irregularly built. The chief entrance is through the Cañon de Marfil, a long rift in the mountains beginning near Marfil station at the foot of a lofty hill, La Bufa. To the N. of the town is Mt. del Cuarto, with Mt. de la Serena to the E., Mt. San Miguel, and Mts. Mellado, Cata, Valenciana and others to the SE. The ground beneath the town is honeycombed with tunnels and shafts which tap rich veins of gold and silver; the main streets are narrow, steep, and tortuous, and sometimes have stone steps, while the roof of one house is often on a level with the floor of the next, and many are reached by high stairways cut out of the rock. The houses are mostly very solid. The town is closely built, the comparatively level part of the site being much sought after, and the surrounding hills are dotted with houses, churches, and mining machinery and dumps. The main streets vary from 25 to 35 ft., but some of the by-streets are only 15 ft. wide; with the exception of the chief streets, which are asphalted, they are cobbled, and there is little vehicular traffic apart from the trams. The shops are near the Plaza Mayor and the Jardin de la Union, where there is a fine theatre. The Government palace is a large three-storied building, and there are a market, almshouses and two hospitals, the Belem and the American; the latter stands high above the Paseo de la Olla. The chief churches are the parochial church of San Francisco, in the Calle de San Francisco, where there is an ancient and venerated image of the Virgin, the Jesuit church, La Compania, in the Plaza of the same name, and San Diego, in the Plaza de la Union. There is also the fine church of San Cayetano, about 2 m. from the town, on a hill, which was built for the Valenciana mining centre, where there are now only a few people. On the Cerro de Trozado, W. of the town, is the Panteon

(cemetery), where bodies are kept exposed in catacombs, or in receptacles in the walls. The Alhondiga de Granaditas, an historic building now used as a prison, stands near the entrance to the town, at the foot of the Cerro del Cuarto. *Industries*: mining centre, and the distributing centre for a large district. Wool, cotton and flour mills, ore-crushing installations, stone quarries near Presa de la Olla, &c. *Roads*: see Appendix II, Routes 47, 55, 56, 59-62, 64. *Railway*: Mexican Central, branch line from Silao (15 m.). Station faces the Calle de Tepetata, about 15 min. walk from centre of town. See Appendix III, Section vi. *Tramways*: animal traction, in town and to suburbs, including La Presa, La Pastila, and the Bustos mine. *Electric light*, by low pressure alternating current from the water-power station of the Guanajuato Power and Electric Co. on the Duero river near Zamora, 100 m. away. The former electric power station is now used for transforming the current. The town is very badly lit, except in the Plaza San Diego. *Water-supply*: municipal. A reservoir is formed by a dam across the valley above the town, which only receives part of the supply. The supply from another large reservoir of the same kind, called Presa de la Olla, is piped to the town, which is supplied with hydrants in most streets at a distance of 150 yds. apart. Since the supply is drained from the surrounding hills, it is difficult to keep it unpolluted. The Guanajuato river, which was liable to flood and cause great damage, owing to the enclosed position of the town in its narrow valley, is now carried through a large tunnel.

Guaymas, port, State of Sonora, on Pacific coast, 265 m. S. of the international frontier.¹ Pop. 9,000, including 500 Yaqui Indians and about 1,000 Chinese. *Situation*: on N. side of Guaymas Bay on a strip of level ground backed by barren hills. Town is laid out on rectangular plan, well built, with moderately wide but unpaved streets. Cement sidewalks in principal streets. Most of the buildings are one-storied stone or adobe structures. On western outskirts

¹ Plan of Guaymas in case accompanying this volume.

are many timber shanties. Principal buildings are a cathedral with two towers, post office, custom-house, town hall, prison, and theatre. Three hospitals. Town moderately healthy. *Industries*: export of wheat, maize, cotton, tobacco, sugar, leather, copper, gold, silver, and pearls. Tanneries and manufactures of saddlery and straw goods. *Roads*: see Appendix II, Routes 2, 3. *Railway*: Southern Pacific N. to Nogales (frontier station), 265 m., and SE. to Mazatlan, 479 m., see Appendix III, Section i. Railway station on E. of town with small repair shops; latter reported destroyed in revolution. Large shops at Empalme, 5 m. distant. *Tramway* from railway station to W. of town. *Electric lighting*: power station near railway station. *Water-supply* fair: from reservoir 3 m. inland. Laid on to all houses and to town pier. Waterworks owned by private company. Best water brought from Empalme in tank cars. Efficient sewerage system. No fire brigade. *Supplies*: about 4,000 tons of coal used to be kept in stock, mainly American, but some Welsh. Plenty of lubricating oil, but no oil fuel. *Wireless station* at Ensenada Bocochoibampo, 3 m. W. of Guaymas Bay.

Port.—Vessels drawing less than 10 ft. can anchor in complete shelter $\frac{1}{2}$ m. from the town. Large vessels must lie outside the harbour but inside Pajaros Island. This anchorage is sheltered, but is 2 m. from the town. No wharves and few facilities for handling cargo. Railway company's pier destroyed by fire in 1913. Town pier accessible only to boats. Patent slip, belonging to Federal Government, 200 ft. long and 900 tons' lifting power, near Punta Baja at entrance to harbour. Ample supply of lighters.

Hermosillo, capital of State of Sonora, 1,318 m. NW. of Mexico City.¹ Pop. 14,500. Alt. 693 ft. *Situation*: on broad plain at entrance to the cañon of Sonora river with low hills of Colorado to the N., and Chanate hills to the W. The Horcasitas river skirts one edge of the town. Close to the town is the Cerro de las Campanas, of white marble. The

¹ Plan of Hermosillo in case accompanying this volume.

town is celebrated for its fruit, particularly oranges, and its fine climate, and it is surrounded by fields of melons, dates, figs, sugar-cane, &c. It measures about $1\frac{1}{2}$ m. square, and the streets are from 30 to 60 ft. wide. The shops are in the Calles Lerdo and Don Luis, and the cathedral, the church of the bishop of Sonora, and the Government palace, are in the Plaza de Zaragoza. Hospital. *Industries*: fruit-growing. Centre of lively trade, and market town. Flour and cotton mills, brewery, foundry, brandy and soap factories, &c. Chief fruit-growing plantations are those of Las Playitas, $2\frac{1}{2}$ m. from the town, and Huerta de la Esmeralda. *Roads*: see Appendix II, Routes 2, 4-7. *Railway*: Southern Pacific. Station $\frac{1}{4}$ m. from town. See Appendix III, Section i. *Tramcars*, to station. *Water-supply*: reservoir on Cerro de las Campanas, and thence by gravity to the town, with a head of 50 ft. The supply is constant, and there are hydrants at the corner of each block in the centre of the town.

Iguala, State of Guerrero, 146 m. S. of Mexico City. Pop. 8,000. Alt. 2,411 ft. *Situation*: on almost level site, sloping gradually to the SE., in centre of a rich mining and agricultural district, with many large tamarind trees. Town is subject to earthquakes, and many houses were destroyed and historic buildings badly shaken by one in 1907. It is the favourite starting-point for places not touched by the railway in Guerrero, since horses and guides are easily procurable. *Industries*: oil and ice factories. Plums and tamarinds are grown. *Roads*: see Appendix II, Routes 75, 83. *Railway*: National, Cuernavaca line. See Appendix III, Section xxii. *Water-supply*: piped, but is much mineralized and causes digestive disturbances, anaemia, &c.

Irapuato, State of Guanajuato, 220 m. NW. of Mexico City. Pop. 21,000. Alt. 5,800 ft. *Situation*: on banks of Irapuato river, which is crossed by several bridges, in very productive region. The climate is fine and equable. The town, which is old, quiet and unprogressive, measures about $\frac{3}{4}$ m. by $\frac{1}{2}$ m. The streets are mostly from 30 to 40 ft. wide. The chief churches are that of San Francisco, and the Temple de

Guadalupe. There are a municipal palace, a hospital, and fine gardens on the outskirts. *Industries*: flourishing trade. Quantities of strawberries are grown in the neighbourhood all the year round, and sold in the town. Manufacture of wool and cotton goods; foundry; tannery; soap and carriage factories. *Roads*: see Appendix II, Routes 28, 55, 56. *Railway*: Mexican Central. Junction for Guadalajara and Pacific Coast branch. Passengers for Lake Chapala region, Tuxpan, Zamora, Colima, Manzanilla, &c., change here; trains from same station, which is $\frac{1}{2}$ m. from town. See Appendix III, Sections vi, xxix. *Tramcars*, to station. *Water-supply*: from artesian wells. There is a small pump in the chief Plaza, driven by an electric motor, which fills a small tank. Water is delivered to the houses by hand.

Jalapa, or Xalapa, former (?) capital of State of Vera Cruz, 213 m. E. of Mexico City. Pop. 24,000. Alt. 4,681 ft. *Situation*: about half-way up the Atlantic slope of the central plateau, on the Cerro de Macuiltepec. The beautiful climate has made the town a popular health resort. The Cope de Perote (13,500 ft.) shuts in the valley to the W., with Mt. Orizaba to the S. of it. The town and surrounding valleys are full of fruit-trees and flowers, and Jalapa is one of the oldest, and most picturesque places in Mexico; the streets, which are cobbled, are narrow, steep, and tortuous, and the houses are mostly massive old Spanish buildings, with tiled roofs. Several rapid streams run through the lower part of the town. The cathedral stands in Parque Lerdo, facing the Government palace, and there are a market, a number of old churches, a bishop's palace and seminary, an observatory, and two hospitals. The inhabitants have a reputation for hospitality. The hot springs not far from the town on the Carrizal *hacienda* are noted for the cure of rheumatism and skin diseases. *Industries*: centre of coffee-growing region, the produce being largely sold in the town. Celebrated cigar factories, the largest, Valle Nacional, being in the Plaza de San Jose, in the NE. part of town. Distributing centre for a rich agricultural region. Cotton mills, brewery, tobacco and chocolate

factories, tanneries. *Roads*: see Appendix II, Routes 123, 124, 125 A, 128, 129. *Railway*: Interoceanic. See Appendix III, Section xvi. Station at W. edge of town, at foot of sharp slope leading up to Plaza. Also line worked by Jalapa Railway and Power Co., connecting with the small towns of Coatepec, Jico, and Teocelo. *Tramcars*, to station. *Electric light* and power, from a power-station at the Xico falls. *Water-supply*: for drinking, not abundant. No drainage system.

COATEPEC, 7 m. (pop. 7,600), is a typical Indian town, with a cotton mill. **XICO** (13 m.) has a waterfall, 256 ft. high. **TEOCELO** (18 m.) has a pop. of 3,300.

Juchitan, State of Oaxaca, 491 m. SE. of Mexico City. Pop. 14,000. Alt. 65 ft. *Situation*: on banks of Perros river. An ancient town, known as the home of a tree with curious red flowers, which is much venerated by the natives. Municipal palace. The streets are sandy, and hygienic conditions bad. Fever and tuberculous disease are very common. No hospital. *Industries*: distributing centre for large extent of country. Salt obtained from the lagoons. *Road*: see Appendix II, Route 94. *Railway*: Pan-American. See Appendix III, Section xxxi. *Water-supply*: from wells, which are frequently contaminated. Supply is insufficient, and alkaline.

Lagos, State of Jalisco, 295 m. NW. of Mexico City. Pop. 12,000. Alt. 6,272 ft. *Situation*: in fertile region. Town is old, poor and unprogressive. The people have a reputation for stupidity and laziness. *Industries*: agricultural centre, cotton mill. *Roads*: see Appendix II, Routes 28, 47. *Railway*: Mexican Central. See Appendix III, Section vi. Station stands among cotton-wood trees. *Tramway*, to station.

La Paz, port, capital of territory of Lower California, on Gulf of California, 250 miles WNW. of Mazatlan. Pop. 6,000. *Situation*: on SE. side of La Paz Bay behind low sandy peninsula of El Mogote. Town covers about $1\frac{1}{2}$ sq. m. Business quarter, closely built, on low, flat ground; residential

quarter with cathedral and barracks on high ground behind. Most buildings one-storied stone or adobe. Massive warehouses for pearl shell. Hospital. Town fairly healthy. *Industries* : exports are silver ore, pearl shell, hides, dyers-weed and guano. Trade mostly with U.S.A. Tannery and pearl-button works. *Road* : see Appendix II, Route 1; *Lighting* is by oil. No fire brigade. *Water* from wells is brackish. *Coal* is not kept at La Paz, but U.S.A. has about 7,000 tons at Pichilínque harbour, 5 m. N. along the shore of the bay.

Port.—The harbour is encumbered with shoals and difficult to reach. Vessels drawing over 13 ft. cannot rely on reaching La Paz, but have to anchor at Pichilínque harbour. Pier with 12 ft. water alongside. Most cargo handled by lighters. No tugs.

La Piedad (Piedad Cabadas), State of Michoacán, 285 m. W. of Mexico City. Pop. 10,000. Alt. 5,767. *Situation* : on banks of Lerma river (over which there is a bridge) on the slope of a high hill, in cultivated and fertile country, noted for its fruits. Behind the town is a range of hills. Many neighbouring farmers live in the place, which is unprogressive and strongly Roman Catholic. Hospital. *Industries* : agricultural centre. *Roads* : see Appendix II, Routes 56, 57. *Railway* : National, Irapuato–Guadalajara line. See Appendix III, Section xxix. Station 4 m. from town. The produce is carried there in ox-carts. *Tramcars*, to station. *Electric light* installation, but no water-supply or drainage system.

Leon (Leon de los Aldamas), State of Guanajuato, 259 m. NW. of Mexico City. Pop. 58,000. Alt. 5,683 ft. *Situation* : in the fertile valley of the Gómez river over which there are five bridges, with the Cerro Gordo to the N. Climate is mild and pleasant, and there are many shaded plazas and gardens in the town, which measures about $1\frac{1}{2}$ m. by 1 m., and is closely built; the streets are about 40 ft. wide, with some by-streets of 30 to 35 ft., and are straight and clean. The chief are Calles Real, de Guanajuato, los Pachecos, and de la Condeza, with the business centre in the Plaza de la

Constitucion, de Armas, or Mayor which is flanked by old *portales*. The Parque Manuel Gonzalez and La Calzada are the favourite resorts, and many articles of native manufacture are sold in the busy Hidalgo market. There is a striking municipal palace, a cathedral with two towers and a dome, containing a venerated painting by Genovesi, a sanatorium in the Calle Primera Condesa, a theatre, and a hospital. On Mt. Soledad, which is inside the town boundaries, is the sanctuary of Guadalupe. *Industries*: centre of agricultural and mining district, and considerable manufactures of leather goods, spurs and bridles, hats, shawls, and *sarapes*, pottery, sweets, &c. Cotton and wool mills. *Roads*: see Appendix II, Routes 28, 58, 64. *Railway*: Mexican Central. Station about 2 m. W. of town. See Appendix III, Section vi. *Tramway*, to station. *Water-supply*: from artesian wells. Municipal supply decided on, but not in existence in 1914. Leon was largely destroyed in 1883 by a flood of the river Gomez, but a dike of masonry nearly 1 m. long and 10 ft. thick has been erected to guard against such an occurrence.

Lerdo, see under Torreon.

Magdalena, State of Sonora, 1,439 m. NW. of Mexico City. Pop. 4,000. Alt. 2,460 ft. *Situation*: in centre of rich mining and agricultural region. A *fiesta*, to which many Indians make long pilgrimages, is held in September and October in honour of San Francisco de Xavier. *Industries*: prosperous town, mining centre. The power house of the Black Mt. Mining Co., whose mines lie 45 m. to the E., is near Magdalena railway station. *Road*: see Appendix II, Route 2. *Railway*: Southern Pacific. Station 1 m. E. of town. See Appendix III, Section i.

Manzanilla (or Manzanillo), port, State of Colima, on Pacific coast, 385 m. W. of Mexico City. Pop. 1,000, including many Chinese. *Situation*: on the S. side of Manzanilla Bay, separated from Cayatlan lagoon by low range of hills behind town. Also protected by hills on W. With exception of Salina Cruz, Manzanilla is best situated Pacific port for access to Mexico City. Town old, but growing on a rectangular

plan on reclaimed ground. Streets narrow and unpaved. Buildings mainly of timber and one-storied. Public school and town hall are only massive buildings. Nearest hospital at Colima. Rainfall heavy and town unhealthy. *Industries*: exports of silver, hides, coffee, and hard woods. A large cartridge-making factory reported to be in construction in 1917. *Roads*: see Appendix II, Route 34. *Railway*: National to Colima (60 m.), Guadalajara (221 m.), and Mexico City (385 m.). See Appendix III, Section xxviii. *Lighting*: oil is the chief illuminant, but there is also electric light. *Water-supply* is bad. The only good water is brought from Colima in railway tank cars. The railway has a 125,000-gallon tank at Campos, $2\frac{1}{2}$ miles from the town. No sewerage system or fire brigade. *Supplies*: local firms hold about 1,000 tons of coal. Lubricating oil can be obtained.

Port.—Extensive harbour works begun in 1900 but not yet completed. Port protected on W. by a massive breakwater 467 yds. long. Sea-wall, 2,000 yds. long, along the beach. Space reclaimed behind sea-wall, about 7 acres, filled in and affords site for growth of town. Port now has 165 acres of sheltered anchorage in $4\frac{1}{2}$ to 9 fathoms. Vessels cannot lie alongside. Only pier was destroyed by fire in 1914 and has not yet been rebuilt. One 10-ton crane. Poor supply of lighters. Railway lines to harbour. Extensive port works projected, including eight masonry piers, extension of breakwater and a coaling station. Port works by an American firm. Port property of Federal Government.

Matamoros, State of Tamaulipas, 841 m. N. of Mexico City. Pop. 9,000. *Situation*: on clay soil, in sugar-producing country, near mouth of Bravo river or Rio Grande, which runs round the N. and E. of the town. To the E. are the small lakes of Bravo and Los Cuarteles. The buildings are mostly of brick, and the streets broad and regular, but very dusty or muddy. There are a municipal palace, a theatre, and a hospital. *Industries*: import and export trade. Fair in May. *Roads*: see Appendix II, Routes 106–109. *Railway*: branch line from Monterey, 204 m. distant. See Ap-

pendix III, Section vii. Also connected by bridge across river with St. Louis, Brownsville, and Mexican Railway to the U.S.A.

Mazatlan, port, State of Sinaloa, on Pacific coast, 479 m. SE. of Guaymas and 197 m. NW. of Tepic.¹ Pop. 22,000 in dry season and considerably less in wet season; many Chinese. *Situation*: on a small peninsula with shallow creek to E. and Pacific Ocean to W.; peninsula extends S. of town, narrowing and rising to a height of about 300 ft. Town reaches to sea on W. in Olas Atlas Bay where a sea-wall has been built. It was founded about 1822 as a mining centre, but has since developed as a sea-port. It covers about 1 sq. m. and is laid out on a rectangular plan. The heart of the town has narrow streets and is congested. Chief streets roughly paved: cement sidewalks. Most of the buildings are of stone, and, except in the business quarter in the SW., one-storied. Principal buildings are custom-house, town hall, public baths, and nautical school. A Federal palace was in course of construction in 1912. Two hospitals and two private sanatoria. Town is unhealthy. *Industries*: export trade in gold, silver, hides, coffee, and dye-woods. Factories include iron foundry, carriage works, match, soap, boot, tobacco, and chocolate factories, tanneries, saw-mills, and cotton mills. German and Spanish interests predominate in commerce, but trade is chiefly with U.S.A. *Roads*: see Appendix II, Routes 9, 11, 26. *Railway*: Southern Pacific Railway N. to Guaymas (497 m.) and the United States and S. to Tepic (197 m.); its extension to Guadalajara is under construction. See Appendix III, Section i. *Tramways*, horse traction; from custom-house to the east of town. *Electric lighting* has entirely replaced gas. *Water-supply* is good, but scarcely adequate. It comes from Penuhuca, at a distance of 20 m., to the town reservoir, which has a capacity of 2,000,000 gallons. Water is laid on to all houses. *Drainage works*, by a British firm, are good. *Police* force, but no fire brigade. *Supplies*: about 11,000 tons of Australian coal imported

¹ Plan of Mazatlan in case accompanying this volume.

annually by local steamship company. A good supply of lubricating oil in stock. *Wireless* station.

Port.—Large vessels lie in an open roadstead at least a mile from the town. Vessels drawing not over 6 ft. can find sheltered anchorage about $\frac{1}{4}$ m. from the town. Proposals to make Mazatlan a deep-water port several times put forward, but deferred. Two boat piers. Good supply of lighters and launches for towing them. Steam tug. No railway lines to port. One 5-ton steam crane on custom-house pier.

Merida, capital of State of Yucatan, 770 m. E. of Mexico City (no through railway).¹ Pop. 62,000. Alt. 25 ft. *Situation*: in very flat agricultural country, entirely devoted to henequen production. The town, which is wealthy, is almost entirely of massive Spanish construction, regularly built, and full of palms and almond trees. The streets are somewhat narrow, from 30 to 35 ft., but they are clean and well paved with brick or asphalt; the widest street is Calle 65, which is the chief business quarter. There is a beautiful cathedral, a bishop's palace, a Government palace, a model penitentiary, a large hospital, an asylum and a theatre. The streets are numbered, even numbers running N. and S., and odd numbers E. and W. There is a large Syrian merchant colony, living mostly in big houses in Calle 50. *Industries*: supply of necessities to surrounding district. Little local manufacturing; place is dependent on the purchasing power of henequen industry. Soap, chocolate, tobacco, hemp factories; brewing. *Roads*: see Appendix II, Routes 135, 138. *Railways*: United Railways of Yucatan, 4 lines, with 4 separate stations: (1) Main line of West Division to Campeche and other towns of Yucatan; station (Peninsular) SW. of Plaza Principal; (2) Broad-gauge line to Progreso (22 m.); station (de la Mejorada) NE. of Plaza in Calle 57; (3) Narrow-gauge line to Progreso; station (San Cristobal) SE. of Plaza in Calle 69; (4) Line to Peto (93 m.); station (Peto) SE. of Plaza in Calle 54, near San Cristobal station. See Appendix III, Section xxxii. *Tramways*, centring at Plaza, to several neighbouring

¹ Plan of Merida in case accompanying this volume.

places; also motor omnibuses. *Wireless* receiving station. *Electric light*, with power station in Calle 48, near its junction with Calle 61. Continuous current, generated at low pressure. Streets in centre fairly well lit. Near the power station is a small gas-works (water-gas, enriched with oil for lighting purposes), but gas is not much used as an illuminant. *Water-supply*: from artesian well, raised by gas-pumps to tank. This installation is in the hands of an American company, but is not much used, as most of the houses raise their own water from the underground basins or caves formed by the river, by means of windmills on the roofs. Hydrants at each corner in the district served by the mains of the public supply. Modern drainage system.

Mexico City, capital of the Republic and of the Federal District.¹ Pop. 471,000. Alt. 7,466 ft. *Situation*: on small plain in the SW. part of the Valley of Mexico in an agricultural and manufacturing district, 8 m. from the W. shore of Lake Texcoco. The whole of the site, with the exception of a small area round the Plaza de la Constitucion, has been reclaimed from swamps and lakes; in the past Lake Texcoco has inundated the city several times, but its level is now considerably lower. The city, which measures about $4\frac{1}{2}$ m. by 4 m., is divided into quarters (*cuarteles*), and again into squares (*manzanas*); it has grown very rapidly westwards, the older portion lying to the E., N., and S. of the chief Plaza.

There are no basements or cellars, owing to the nature of the land on which the city stands, and sinking of buildings and their foundations is frequent. The older part is most solidly built; the houses are often of a local soft stone, rubble, brick, or hard stone, and there are a number of steel-frame buildings of 4 or 5 stories. The streets are from 40 to 50 ft. wide in the more important districts; the Avenida Cinco de Mayo, one of the busiest streets, is the widest. Other chief business streets are the Avenida de San Francisco, Plaza de la Constitucion (or Mayor), Calle de Gante, Avenida 16 de Septiembre. The chief residential district is in and

¹ Plan of Mexico City in case accompanying this volume.

round the Paseo de la Reforma, and there are a number of 'colonies' in the outskirts and just beyond the municipal area, which are only partially built over, often with somewhat flimsy brick houses. The Plaza has to the N. the cathedral, the most imposing church of Mexico, with a valuable painting by Murillo; to the E. the large national palace, in part of which is the National Museum; to the S. the municipal palace and the flower-market; to the W. the Portal de los Mercadores, a busy arcade, and the Monte de Piedad, or national pawn-shop. S. of the Plaza is the large fruit-market, called the Thieves' Market. The national picture-gallery of San Carlos, where there is an old and valuable collection, lies behind the national palace. There are numerous churches, the chief one, after the cathedral, being that of San Francisco, in the Avenida de San Francisco. The poor asylum (Hospicio de Pobres), with 1,000 inmates, is 1 m. S. of the national palace, the Jesus Nazareno hospital in Calle de San Felipe Neri (SE. district), the old Belem prison in the SW. part of the city, and the large and well-appointed penitentiary in the E. part. On the W. outskirts is the park of Chapultepec, with the castle of the same name, and SW. of it a large cemetery, the Panteon de Dolores, on the slope of a hill. The American and Spanish cemeteries are near Tacuba, and the English in Tlaxpana. In the centre of the city, W. of the Plaza, is the Alameda, a large park, with the national theatre on its E. side. The bull-ring is in Colonia Condesa, 2 m. SW. of the Plaza. The Mexican Country Club, a large building, is near Churubusco, S. of the city.

Industries: commercial, financial and political centre of the Republic. Distributing centre, with fairly important manufactures in and around it, which have been much helped by the development of electric power, supplied largely by the Mexican Power and Light Co. In 1910 there were 153 manufacturing establishments in the city, the most important being wool and cotton mills, tobacco factories, and foundries.

Roads: see Appendix II, Routes 51, 69, 75, 85, 86, 116, 125.

Railways converge on the city, which is connected with the

chief ports, and nearly all the State capitals. For details, see Appendix III, *passim*. (1) Inter-oceanic, to Puebla, Jalapa and Vera Cruz, &c.; station (San Lazaro) on E. outskirts, $\frac{1}{2}$ m. W. of Plaza. (2) National, to Cuernavaca, Pachucha, Guadalajara, Manzanilla, El Paso and U.S.A., &c.; station (Buena Vista) in NW. district. (3) Mexican, to Puebla, and Vera Cruz, via Cordoba, &c.; station next to Buena Vista station on the E. (4) National, to Laredo, Uruapan, &c.; station (Colonia) in Plaza del Ferrocarriles Nacional, $1\frac{1}{2}$ m. W. of Plaza. (5) Hidalgo and North-Eastern, to Pachucha Tepa, Beristain, &c.; station (Peralvillo) $\frac{1}{2}$ m. N. of Plaza. (6) San Rafael and Atlixco, Xico route; station in Callejon de Xico, in SE. part of city. (7) Drainage works of Valley of Mexico line, to Tequixquiac; trains leave from Peralvillo station. The ticket offices of the Constitutionalist Railways (which include all but the Mexican Railway) are in Avenida 5 de Mayo, just W. of the Plaza, and the offices of the Mexican Railway are in the same street.

Tramways, electric, to all parts of the city and suburbs (see Appendix III, Section xxxiv). Power from the Mexican Light and Power Co. station on the Necaxa and Tenango rivers in Puebla where water-power is available.

Wireless telegraph station in suburb of Chapultepec.

Electric light, with power also from the Mexican Light and Power Co. and only a receiving station in the city. Owing to the long distance over which the alternating current is transmitted, the pressure is very high, 60,000 volts. The electric mains run overhead, except through the centre of the city. There is an oil gas supply which is designed to compete with the electric supply for lighting and heating.

Water-supply: (1) from springs in Desierto, Los Leones, and Santa Fé hills, 12 to 15 m. from city, and thence by partly open aqueducts to a concrete reservoir, 82 ft. high, $2\frac{1}{2}$ m. from city (near Molino del Rey), and from there by gravity through pipes to the N. part of the city. This supply can be augmented in the dry season by water from Rio Hondo, delivered through an open ditch 37 m. long into the reservoir

at Maino del Rey. (2) From Chapultepec springs ($2\frac{1}{2}$ m.), and from a spring at La Noria, near Xochimilco (15 m.). This supply is raised by pumping (3 Worthington steam pumps) to concrete tanks on Chapultepec hill, and carried thence for $2\frac{1}{2}$ m. by pipes to SE. part of the city. The two systems can be connected. The pressure is practically nil everywhere in the city during the hours when the water is most used, and the water has to be pumped to tanks on the roof in each house; the pipes are very old, and the tanks often uncovered. There are hydrants at each street crossing, with extra ones in front of the public buildings. The springs are liable to considerable variation, and the supply is often insufficient, even though it does not serve the whole city. A new and improved system was in course of construction in 1911, and was intended to be finished at the end of 1912. There are a large number of artesian wells in the suburbs. There are 3 fire-stations, with 6 hand engines and 4 steamers, horse-drawn.

The following are the chief suburbs of Mexico City :

COYOACAN, about 8 m. S. of Plaza. The oldest of the suburbs. The old Cortes palace lies on the N. side of the Plaza, which is full of trees and flowers. S. of the Plaza is the church of San Juan Bautista and the Dominican monastery. The old house of Alvarado is in the town. School of forestry.

GUADALUPE-HIDALGO, $2\frac{1}{2}$ m. to NE. Pop. 8,200. Alt. 7,680 ft. *Situation* : to S. and E. of Cerrito de Tepeyacac. There is a large church with a miraculous picture of the Virgin, which is the most sacred and popular shrine of the Republic, and is visited by enormous numbers of Indians on pilgrimage, the chief festivals being in December. Two squares NE. of the church is the Chapel of the Well, where there is a mineral spring with a legendary history.

MIXCOAC, 9 m. to SW. Pop. 13,200. Alt. 7,792 ft. Many people from Mexico City live in this suburb, where there are large nursery gardens, and brick-works.

SAN ANGEL, about 9 m. SW. of Plaza. Pop. 11,000. Alt.

7,700 ft. Much fruit—pears, apples, strawberries, apricots, &c.—is grown here, the climate being specially favourable, owing to the position of the town on the slope of the mountains to the SW. of the Valley of Mexico. There are a number of country houses in large gardens, and a fine church. An open air market is held in the Plaza on Sundays.

TACUBAYA, 7 m. to SW. Pop. 36,000. Alt. 7,621 ft. *Situation* : on slope of Sierra de las Cruces. One of the most populous and fashionable suburbs, with many large country houses, standing in parks. The National Astronomical Observatory, which fixes the prime meridian of Mexico (99° 7' W. of Greenwich), commands fine views. There is a meteorological observatory also. Paper mill and boot factory.

TIALPAN, 11 m. S. of Plaza. Pop. 6,800. Alt. 7,614 ft. *Situation* : on slope of Mt. Ajusco. Caves, springs, and orchards in vicinity. The farthest out, and one of the healthiest and most picturesque of the suburbs. Quantities of fruit (chiefly apples, pears, and apricots) and flowers are grown. The church of San Agustin de las Cuevas stands in the chief Plaza. There are a modern municipal palace, a large paper-mill, and wool and cotton mills. The Pedregal (stony place), a basaltic lava stream 2½ m. wide and 6 m. long, lies N. of Tlapan and towards Coyoacan. Outposts of the Zapatistas, whose territory lies to the south, have been established here.

Monclova, State of Coahuila, 951 m. N. of Mexico City. Pop. 7,000. Alt. 1,978 ft. *Situation* : on banks of Monclova river. There are several churches, a municipal palace, and a theatre. *Industries* : flour and cotton mills; distillery; manufactures unimportant. *Road* : see Appendix II, Route 100. *Railway* : International. Also branch to Cuatro Ciene-gas, 42 m. See Appendix III, Section viii. *Electric light* installation.

Monterey or Monterrey, capital of State of Nuevo Leon, 635 m. N. of Mexico City.¹ Pop. 81,000. Alt. 1,764 ft.

¹ Plan of Monterey in case accompanying this volume.

Situation : between two spurs of a range of the Sierra Madre, with Cerro de la Silla (4,149 ft.) to E. and Cerro de las Metras (3,618 ft.) to W. in fertile valley of Santa Catarina river. The surrounding country is largely mining and partly agricultural. The climate is variable, but the region is healthy. The town, which is the most important and progressive of N. Mexico, and the seat of a bishop, stands on an undulating site, sloping down to two roughly parallel depressions, marked by the Santa Catarina river, and the hill of Calle de Allende ; the majority of the buildings are very massively built. Though the town dates from the earliest Spanish times, it has been almost entirely modernized, and largely Americanized. In the business quarter the streets running E. and W. are from 30 to 36 ft. wide, and those from N. to S. 10 ft. narrower ; they are paved with brick, which is in poor condition. Outside the business area they are wider. The number of light wheeled vehicles is noticeable. The chief buildings are the fine Government palace, in the east central district, in Plaza Cinco de Mayo ; the cathedral, in the Plaza de Zaragoza (the chief plaza) in the SE. district ; the parochial church of San Francisco, near the cathedral ; the penitentiary, in the centre of the town, in the Alameda Porfirio Diaz ; the bishop's old palace, on Mt. Chepe Vera, in the SW. suburbs, commanding a fine view ; and the hospital. *Industries* : distributing centre for a large and wealthy district, and an important manufacturing centre. Iron and steel works, smelter of American Smelting and Refining Co., large brewery, flour and cotton mills, soap, tobacco and sweet factories, mineral-water works, cement works, &c. *Roads* : see Appendix II, Routes 104, 105, 107, 112. *Railway* : important centre, Mexican Central, to Tampico (322 m.) ; National, to Matamoros. International, from S. and to Piedras Negras. All trains arrive at and depart from Union station to N. of town. See Appendix III, Sections VII, VIII, IX. *Tramways* : electric, to all parts of town and suburbs, smelter works, Topo Chico springs, &c. *Electric light*, with current generated at 2,000 volts, and transformed down to 110 volts by trans-

formers on poles in the streets. The works of the Monterey Light and Power Co. on the N. side of Calle Allende are badly arranged and old-fashioned; the supply is insufficient, and the streets very dark. *Water-supply*: gravity, from two separate sources which can be connected, and serve the upper and lower levels of the city respectively. The system is owned by the Monterey Drainage Co., a Canadian company. The first supply is from the Estanzuela river, with an intake 12 m. S. of the town and 500 ft. above it; the water runs through concrete pipes to a reservoir. The supply and pressure are constant. The second supply, that of San Geronimo, is from an 80-ft. well, $1\frac{3}{4}$ m. W. of the town, and flows by gravity to the Obispado reservoir. The distribution system is modern, but there were only 8 hydrants in 1909. There is a police fire brigade, with a station on the W. side of Calle Benito Juarez, but it is said to be of no practical use. The fire brigade at the brewery renders valuable service in case of fire, and has a good engine.

The TOPO CHICO hot springs, a favourite bathing resort, lie 4 m. NW. of the town, and to the N. of the town is the suburban town of BELLA VISTA.

Morelia, capital of State of Michoacan, 234 m. W. of Mexico City.¹ Pop. 40,000. Alt. 6,200 ft. *Situation*: on rocky hill rising from Guayangareo valley. The Chiquito river runs round the town on S. and W. and joins the Rio Grande, which passes N. of the town. To the NW. is the Pico de Quinceo (10,985 ft.), to the S. the Cerro de San Andres (10,000 ft.), and to the E. the Cerros de Punhuato and Zapote. The town is unusually healthy, though said to be plagued with fleas; the streets, which run down from the central *plaza* and the surrounding fields, are clean and well-drained. Calle Nacional, or Real, the chief business street, Calle Matamoros, and Calle Morelos, are from 50 to 60 ft. wide, and the others somewhat narrower. The town is closely built, and measures about $1\frac{1}{4}$ m. by 1 m. There are some historic houses, including the one inhabited by Morelos,

¹ Plan of Morelia in case accompanying this volume.

a Government palace, a beautiful cathedral with two towers, and many other churches. The Plaza Principal, or Jardin de los Martires, is surrounded by arcades. At the E. end of the Calle Nacional is the end of the old aqueduct, built 1785-9, which still brings drinking water to the city. There are a state pawn-shop and a penitentiary in the Paseo de San Pedro, a prison to the SE. of the town, a fine park (Bosque de San Pedro), and several hospitals. *Industries* : town is of small commercial importance, but there are local manufactures of shawls, hats, &c., flour and cotton mills, soap factory, a brewery, and the place is known for sweetmeats made from quinces and a particular brand of wine. *Roads* : see Appendix II, Routes 50-55, 57, 58, 79, 80. *Railway* : National, from Mexico City to Uruapan. Station 1 m. NW. of plaza. See Appendix III, Section xii. *Tramways*, animal traction, run to station. *Electric light* is installed. *Water-supply* : from five reservoirs, with mains of 19 in. diameter. The pressure varies from 43 to 87 lb. per sq. in. The supply is constant, and there are hydrants at the street corners.

Nogales, State of Sonora, 1,493 m. NW. of Mexico City. Pop. 3,000. Alt. 3,869 ft. *Situation* : on the border line between Mexico and the U.S.A., in an agricultural and mining district. Spanish and English are spoken, and both Mexican and American currency are used. The houses are scattered about on the slopes of a hill, and the climate is healthy. *Industries* : through trade to the U.S.A., distributing goods from Sonora, Sinoloa, and part of Nayarit. Factory of the American Clothing Co., in Calle de Arizpe, cotton and flour mills. *Railway* : terminus of New Mexican and Arizona, Southern Pacific, and Sonora lines, and point of departure for Lower California and the towns on the Pacific coast of Mexico. The American and Mexican stations are within a few yards of one another. See Appendix III, Section i. *Water-supply*, good.

Nuevo Laredo, State of Tamaulipas, 802 m. N. of Mexico City. Pop. 6,500. Alt. 457 ft. *Situation* : in flat alluvial plain on S. bank of Rio Grande (here useless for navigation).

The surrounding country is agricultural and stock-raising. The town is on the Mexican-U.S.A. frontier. There are a number of timber buildings with shingle roofs, but the better and more modern houses have flat roofs. The streets are of a uniform width of about 33 ft. The road-surfaces are very fair, probably owing to the absence of heavy rainfall. There is a municipal palace. *Industries*: distributing centre for surrounding district, which is of moderate and irregular purchasing power, since its prosperity depends on the rains which are apt to fail. The town shares, however, in the prosperity of Laredo, in Texas, on the other side of the river, and in the popularity of this route from the U.S.A. to Mexico, as compared with that via Piedras Negras. *Roads*: see Appendix II, Routes 101, 104, 106. *Railway*: junction of Mexican line and International and Great Northern line of the U.S.A. The junction with the main line of the latter railway is at San Antonio, 120 m. N. of Laredo. There are a railway and a footbridge across the Rio Grande. See Appendix III, Section vii. *Electric light*, by low pressure alternating current of 110 volts, supplied at high pressure from Laredo, and transformed down by transformers on poles in the streets. *Water-supply*: municipal, on a small scale. The water is pumped from the river, and for two-thirds of the year it carries in suspension a quantity of sand, which cuts up the pumps and chokes the pipes; the supply is precarious, but the pressure is fair. Hydrants of U.S.A. pattern.

Oaxaca, capital of State of Oaxaca, 386 m. SE. of Mexico City.¹ Pop. 37,000. Alt. 5,067 ft. *Situation*: on the gentle slope of Soledad hill, with the Jalatlaco river on the E. and the Atoyac river on the W., in an agricultural and mining district. The Cerro del Fortin de Zaragoza, which is crowned by a colossal statue and commands good views, is about 1 m. to the NW., and Mt. Alban, with ancient ruins on the summit, lies 7 m. to the S. To the E. is Mt. San Antonio, to the W. the Creston and Fortin hills, and to the N. Mt. San Felipe del Agua. The town is attractive and healthy,

¹ Plan of Oaxaca in case accompanying this volume.

with many gardens, and the administration is progressive. It has always been an intensely Spanish and Catholic place, and there are many churches, chief among them the cathedral in the Plaza Mayor, the ornate monastery and church of Santo Domingo in the Plaza del Rosario, and the huge church of La Soledad to the N. of the town. The older houses are low and massive, often like small fortresses. The Plaza Mayor, the centre of the life of the town, is surrounded by arcades, and there is a busy Saturday market. The streets are hilly and slope down to the centre; they are traversed by mountain streams, crossed by small bridges. Tuberculosis, enteric, &c., were common, but it is thought the improved drainage and water-supply will lessen their incidence. There are government and municipal palaces, an orphanage, a theatre, and several hospitals, mostly rather old-fashioned. *Industries*: distributing trade and the metropolis for various neighbouring towns, such as Tehuantepec, Salina Cruz, and Ejutla. Numerous local manufactures, including the making of fine wool *sarapes*, jewellery, and pottery, cotton mills, soap and cigar factories, and a brewery. *Roads*: see Appendix II, Routes 86-92. *Railways*: Mexican Southern, connecting with Mexican line from Mexico City to Vera Cruz. Also lines to Ejutla (43 m.), to the mining camp of Taviches (San Geronimo Taviche), and to Tlacolula, for the ruins of Mitla. One station, on the W. outskirts of the town. The Town and Country Railways of Oaxaca run to San Pablo (16 m.), passing a number of suburban towns on the way. See Appendix III, Section xxvii. *Tramways*: also operated by the Town and Country Railways Co., run to San Felipe del Agua, Santa Maria del Tule, &c. *Wireless* telegraph station. *Electric light*: from the hydraulic installation of the Oaxaca Light and Power Co. on the San Augustin river, which also supplies power to the factories. *Water-supply*: from two aqueducts, one (3 m. long) from San Felipe del Agua, the other (6 m. long) from San Andres Huayapan. There have been recent improvements in the waterworks and the drainage system.

The suburban town of SAN FELIPE DEL AGUA ($2\frac{1}{2}$ m. to the N.) is noted for the curious Indian ceremonies which take place there, particularly on All Souls' Day, and attract many visitors. The famous ruins of Mitla lie 25 m. to the SE. in the small Indian settlement of SAN PABLO. SANTA MARIA DEL TULE, in the Tule valley, is famed for its mangoes, and for an enormous tree, a cypress, which stands there.

Orizaba, State of Vera Cruz, 181 m. E. of Mexico City. Recently reported State capital (but see *Cordoba*). Pop. 35,000. Alt. 4,025 ft. *Situation*: in well-watered valley, largely surrounded by hills; to the E. is Cerro de Escamela, with quarries of grey marble, and to the W. Cerro del Borrego, with Mt. Orizaba a short distance away. The surrounding country is agricultural (largely coffee-growing) and mining. The town is old and picturesque; the majority of the buildings are of stone, owing to the heavy rainfall, and have low-pitched tiled roofs, with projecting wooden eaves. Outside the centre of the town the streets are only about 20 ft. wide, but there is one wide street running E. and W. and almost outside the business quarter; the road surfaces are very bad. The Orizaba river runs in a rocky ravine through the town, and there are many beautiful trees and gardens; the climate is mild, and the place is popular as a health resort among people from both the high country and the plains, but cases of enteric, due to the bad water-supply, are common, and fever occurs.

In the chief *plaza* (Plaza Principal, or Parques Castilio é Hidalgo) are the municipal palace and the parochial church, which has a number of domes. There is a large fruit, flower, and vegetable market. Hospital and other charitable establishments. *Industries*: number of cotton and jute mills in neighbourhood, and distributing centre for surrounding district. Orizaba has an abundance of water-power, which has made it a manufacturing centre of some importance; there is a large brewery opposite the station, tobacco factories, marble works, a distillery, &c. *Roads*: see Appendix II, Routes 125 B, 127, 128, 129. *Railway*: Mexican, from

Mexico City to Vera Cruz. Station $\frac{1}{4}$ m. W. of Plaza. See Appendix III, Section xxiii. *Tramways*: animal traction, to Ingenio, Nogales, Santa Rosa, Santa Gertrudis, El Barrio Nuevo, &c. *Electric light*: from power-station in the hills; streets very badly lit. *Water-supply*: only a small domestic system. No public supply for dealing with fires. The water from a tributary of the Blanco river, which is used for drinking purposes, is impure.

Pachuca, State of Hidalgo, 67 m. NE. of Mexico City. Pop. 39,000. Alt. 8,024 ft. *Situation*: at the head of a wide gulch, with hills encircling it, and sloping sharply up from the ends of the streets. The country is mountainous and volcanic. The town, which is exposed to winds, is one of the oldest and most famous mining settlements of the country; the hills are honeycombed with mines and tunnels, and dotted with the stone shafts which define the mining claims. Pulmonary disease and rheumatism, due to the trying climate, and *ankylostomiasis* (hook-worm disease) are common. Hygienic precautions in the mines have lessened the incidence of the last-named. The town is closely built, the available level ground being limited, and the streets, which are about 30 ft. wide in the centre of the town, are winding and cobbled, and difficult for wheeled traffic. There is a fortress, the *caja*, in the Calle de las Cajas, a government palace, a theatre, and a fairly good hospital. Not far from the town is the famous Xixi Mt., at the foot of which are immense curiously-shaped rocks (Penas Cargadas), and on the Regla *hacienda* there is a huge basaltic formation known as the Giant's Causeway of America. *Industries*: centre of very rich silver-mining industry, on which the town is entirely dependent; several ore reduction plants on the outskirts. The principal operating companies are Real del Monte of Pachuca, San Rafael of Sechbach, La Blanca, Maravillas of San Francisco, La Union, Purissima Grande, and Blaisdell Coscotitlan Syndicate. The Real del Monte mine (6 m. from Pachuca), where there is a large settlement of some 10,000 people, is one of the most extensive mining properties in the world. *Road*: see Ap-

pendix II, Route 116. *Railways*: three routes from Mexico City: (1) Central, the shortest route, with no change; (2) Mexican, on the main line as far as Ometusco, and thence by the Ramal de Pachuca: these two lines start from the Buena Vista station in Mexico City; (3) Hidalgo and North-eastern, via Tepa and Irolo, from the Peralvillo station in Mexico City. See Appendix III, Sections xiii, xxiii. The station at Pachuca is 1 m. from the town. *Tramways*: 17 m. in length; steam and animal traction. The roads round the town are poor and extremely hilly. *Electric light*: supplied by the Pachuca Light and Power Co., and drainage system; streets badly lit. *Water-supply*: small, for domestic purposes only, from springs and wells. A water famine used to be almost incessant, but it was reported in 1916 that work had been begun on a new reservoir for drinkable water.

Parral, or Hidalgo de Parral, State of Chihuahua, 908 m. from Mexico City. Pop. 10,000. Alt. 6,200 ft. *Situation*: on banks of Parral river, at foot of Sierra de la Cruz, a high hill with a cross on the summit. The Plaza de Hidalgo, with the municipal palace and the parochial church, is the centre of the life of the town, which is clean and healthy; the old church of La Virgen del Rayo lies on the opposite side of the river to the main part of the town. *Hospital*. *Industries*: many important mines and mining centres in neighbourhood (which is traversed by a great mineral vein, the *veta colorada*), such as Minas Nuevas (8 m.) and Santa Barbara. Few other industries; shoe factory. *Railway*: Central, from Jimenez. See Appendix III, Section vi. Station on level plateau about 1 m. from town, to which it is joined by a rocky road. Also Parral-Durango line to Minas Nuevas, and a line to Santa Barbara (5 m.), leaving the main railway at Adrian, 12 m. from Parral. *Tramways*: electric, run to station. *Electric light* installation. *Water-supply* for drinking purposes, and for extinguishing fires.

SANTA BARBARA, (pop. 6,700), an old mining camp, with smelters and reduction works, lies 11 m. from Parral, in a broad valley surrounded by hills.

Parras, State of Coahuila, 669 m. N. of Mexico City. Pop. 6,500. Alt. 4,987 ft. *Situation*: in fertile and well-watered valley. The town is surrounded by orchards and vineyards, and has a municipal palace, and a penitentiary. *Industries*: important centre of viticulture, whence wines and raisins are exported all over the Republic. The grapes are said to equal those of Malaga and Granada. Cotton and flour mills. *Roads*: see Appendix II, Routes 20, 103. *Railway*: National, branch from Saltillo, 100 m. distant. See Appendix III, Section vii.

Patzcuaro, State of Michoacan, 272 m. W. of Mexico City. Pop. 10,000. Alt. 6,717 ft. *Situation*: on slope of small range of hills, overlooking Lake Patzcuaro. The town is poor, straggling, antiquated, and quiet; the narrow, cobbled streets, lined with old houses with projecting upper stories, lead up and down the hillside. The chief plazas are Plaza Principal and Plaza Chica; $\frac{1}{4}$ m. E. of the latter is the old church of La Colegiata, on the crest of a hill. To the W. is the Cerro del Calvario, less than 1 m. distant, with a good view of the lake. Hospital. *Industries*: metropolis for the Indian villages round the lake; the Indians bring produce and home-made wares to sell in the town, which was formerly noted for pictures made of feathers, an art now nearly lost. Flour-mill. *Roads*: see Appendix II, Routes 52, 54, 79, 80. *Railway*: National, Acambaro-Uruapan line. See Appendix III, Section xii. Station $1\frac{3}{4}$ m. W. of town, and reached by a steep, cobbled road. *Tramways*: animal traction, run to station. *Water-supply*, from a spring.

Penjamo, State of Guanajuato, 260 m. NW. of Mexico City. Pop. 9,000. *Situation*: in rich and well-watered district, near Mt. Guachichil. The Penjamo river runs through the town, which is well-to-do. *Roads*: see Appendix II, Routes 56, 58, 65. *Railway*: Mexican Central, Irapuato—Lake Chapala line. See Appendix III, Section xxix. Station 3 m. from town at bottom of steep hill. *Tramways*: run to station by gravity.

Piedras Negras (formerly Ciudad Porfirio Diaz), State of Coahuila, 1,097 m. N. of Mexico City. Pop. 9,000. Alt.

918 ft. *Situation* : on right bank of Rio Grande (which contains very little water and is sometimes practically dry) in a flat alluvial plain, devoted to agriculture and stock-raising. The town, which is entirely modern, is connected by a bridge with the frontier town of the U.S.A. on the other side of the river, Eagle Pass, a more important place than Piedras Negras. There is a considerable number of houses built partially or entirely of timber, particularly in the outskirts of the town, but the buildings of the business quarter are mostly of solid construction ; the roofs are partly hard, and partly shingled or thatched. The general width of the streets is 33 ft. ; a few have side-walks, but the road surface is usually bad. There are a market and a theatre. *Industries* : distributing centre for surrounding country, but trade is of very little importance, and there is little tourist traffic through Eagle Pass, which is off the main line. *Road* : see Appendix II, Route 100. *Railway* : International, connecting with Galveston, Harrisburg, and San Antonio line of the U.S.A. See Appendix III, Section viii. *Electric light* : from power station in Eagle Pass ; streets not well lit. The current is generated at 2,200 volts, and transformed down to 110 volts by transformers on poles in the street. Wiring fair for Mexico. *Water-supply* : small, for domestic purposes only, from water-works in Eagle Pass.

Progreso, port, State of Yucatan, 22 m. N. of Merida.¹ Pop. 5,200. *Situation* : on N. coast of Yucatan Peninsula, Gulf of Mexico. The town stretches along an unkempt sandy beach, behind which is a narrow lagoon (Rio Fraga). Between the shore and the lagoon the town is laid out with streets crossing each other at right angles. The main thoroughfare, Calle 30, leads inland from the Plazuela del Muelle, behind the customs pier (see below), and enters and continues beyond the Plaza de la Independencia, which, with the Parque Zaragoza, occupies the centre of the town. Here are the town hall, the parish church, and (in the Parque) an astronomical observatory. Calle 30 is about 60 ft. wide ;

¹ Plan of Progreso in case accompanying this volume.

others are generally from 40 to 45 ft. wide ; all are sandy and dusty. The town is very largely built of timber, except in one or two of the more important streets. Practically all buildings are of one storey. On the beach about a mile from the town is the so-called American colony. *Industries* : connected with the business of the port, which is the principal in Yucatan, and one of the most important in the world for the export of henequen or sisal hemp. Hides, chicle, and deer-skins are also exported. *Fisheries*. *Railways* : Constitutional (United) Railways of Yucatan ; two lines to Merida, (a) gauge 4 ft. 8½ in., 22 miles, (b) gauge 3 ft., 29 m. ; connexion through these with Yucatan system generally, and with Campeche. The lines have adjacent stations about ¼ m. from customs pier in Calle 32, close to the Parque Zaragoza. See Appendix III, Section xxxii (a), (d). Rail connexion with the customs-house. *Tramway* encircling the town ; animal traction (?). *Electric lighting*, indifferent, in streets and better houses, but oil lamps are more common. *Water-supply* : scarce and of poor quality ; no regular supply except a private one provided by the Agencia Comercial as a fire service.

Port.—An open, shallow roadstead ; large vessels have to lie 3 to 5 miles out, and discharge cargo into lighters. There are five piers, of which the chief is the Customs or Fiscal pier, approximately 770 ft. long and 45 ft. broad. The mean depth alongside the piers is 10–11 ft. The extension of the piers, and the construction of a dredged harbour within breakwaters, have been contemplated, and it was reported in June 1917 that comprehensive plans had been adopted for the improvement of the port. There is a line of warehouses (said to be fireproof) behind the piers, mostly for henequen. They are connected with the piers by portable rails (1 ft. 7½ in. gauge) on which flat cars (*plataformas*) are drawn by mules. Coal and stores are limited in supply. It is reported (1918) that two large oil-storage tanks, with pipe and pumping connexions to the end of the main pier, are under construction by the Yucatan government ; they

are to be supplied from the Puerto Mexico and Tampico oil-fields, unless oil is found in Yucatan as a result of boring in progress.

Puebla, capital of State of Puebla, 158 m. SE. of Mexico City (via San Lorenzo).¹ Pop. 101,000. Alt. 7,100 ft. *Situation* : on slope of Sierra Madre foothills, commanding wide views, in important agricultural and manufacturing district. The city, which is the third largest in the Republic and the seat of an archbishop, is clean and very healthy. The area covered is 2,500 yds. by 3,000 yds., and the site is almost level. The streets are regular and fairly wide (about 40 ft.) and the buildings, which are mostly of stone and very seldom of adobe, are two-storied throughout the town, with many of three stories in the central part. There are a few new ones of steel frame construction or reinforced concrete and there are many fine private houses. The streets, which are of asphalt, are the best paved in the country after those of Guadalajara and the capital, and are clean. The chief business district is round and N. of the Plaza Principal or de la Constitucion. There are over 60 churches, and the architecture is largely Andalusian, with a liberal use of coloured Moorish tiles, Puebla having been the first city to manufacture the widely-used Talavera ware. The place is strongly Roman Catholic, and was in the past reactionary, but a few years ago large sums of money were spent on paving, drainage, a new market and hospital, &c. Among the churches are the very rich cathedral (containing many pictures, marquetry work, &c.) in the Plaza de la Constitucion, with the municipal palace opposite; San Francisco, with a fine tower, to the E. of the city; and San José, to the N. There is a penitentiary to the W., a prison for men in Calle San Juan de Dios, one for women in Calle del Callejon de Jesus, and a house of correction in Calle del Cuadrante de San Marcos; in the Plaza San Agustin is a maternity home. *Industries* : important cotton-spinning, manufacturing, and distributing centre, with a number of mills in the neighbour-

¹ Plan of Puebla in case accompanying this volume.

hood, and local manufactures (including brandy, chocolate, cigar, hat, clothes, match, glass, and shoe factories, many flour-mills and sugar-factories, breweries, and glass-works) in the city, which is also famous for onyx work. Electric power for the factories is provided by the Puebla Tramways, Light and Power Co. *Roads*: see Appendix II, Routes 86, 87, 120, 121, 122, 125. *Railways*: important centre with two indirect routes to Mexico City (via Cuautla, and via San Lorenzo), and terminus of Mexican Southern line. Three stations close together to W. of town with intercommunication. Also small local line through mill district. See Appendix III, Sections xvii, xviii, xxiii, xxvii. *Tramway*: worked by the Puebla Tramways, Light and Power Co. (with offices in the Parque Central), to all parts of the city and suburbs. *Electric light*: current of 10,000 volts from a generating station in the hills, transformed down to 2,000 volts at a receiving station in the city, and then to 120 volts by transformers in the streets. Drainage system. *Water-supply*: municipal, from 3 groups of springs or streams: (1) Cienguilla de San Antonio, to NE. (2) Pasco de San Francisco, to E. (3) Remantillo and De la Rose, also to E. There is an electric pumping installation at each of these places, raising water to reservoirs on Cerro de Toreto, about 116 ft. above the chief plaza. The city is divided into a high-pressure zone, comprising the more important district, and a low-pressure zone. The supply is constant, and fairly satisfactory for a pumping installation. There are hydrants in the centre and at the SW. corner of each block, and a small and useless fire brigade, with a station near the water-course at the SE. corner of the town.

Puerto Mexico (formerly Coatzacoalcas), port, State of Vera Cruz, 481 m. ESE. of Mexico City.¹ Pop. 9,000. *Situation*: on the Gulf Coast, at the mouth of Coatzacoalcas River, on its left (W.) bank. Low wooded hills flank the river on either side, and intervene between the town and the sea-shore. Town is laid out in rectangular blocks, only a few of which are

¹ Plan of Puerto Mexico in case accompanying this volume.

built over. Practically all buildings are of timber, with brick foundations and corrugated iron or timber roofs. On river front and at the business corner near the customs wharf and railway station some buildings are of two stories; remainder are almost all of one storey. The main street is Calle Colon. Streets are 50–60 ft. wide; they slope down, generally, towards the river, and their surface is bad and loose, and washes away in heavy rains. Hospital close to railway station. Health conditions are generally good, though malaria is fairly common. *Industries*: export and import trade (a) transcontinental, via the Tehuantepec Railway, formerly flourishing but now greatly diminished; (b) local, in bananas, fustic, logwood, cedar, mahogany, &c., and in petroleum products from the Mexican Eagle Company's refinery at Minatitlan (see below), which is mainly supplied with crude oil from the company's fields in northern Vera Cruz. *Road*: see Appendix II, Route 131. *Railway*: Tehuantepec National, to Salina Cruz, joining Vera Cruz al Istmo line at Santa Lucrecia (for Vera Cruz, Mexico City, &c.), and Pan-American line at Gamboa. See Appendix III, Section xxx. Railway station near river immediately below customs wharf; 23 m. of track along wharves and in railway yards behind them. *Electric lighting* for wharves and railway buildings, municipal offices, and bull ring; oil lamps in remainder of town. Electric plant is in a detached one-storey brick and stone building with corrugated iron roof. Capacity, 2,500 h.p.; pressure 2,200 volts. Boiler-house adjacent; oil fuel is used. *Water-supply*: small, good water, in hands of municipality; water pumped from two wells outside town (one belonging to the railway company, the other to the municipality) by two sets of triple pumps worked by electricity from railway company's plant to a concrete reservoir containing about 350,000 gallons on a hill about 80 ft. above the wharves. There are 6-in. and 4-in. mains and 24 hydrants (2½ in. waterway) flush with road-surface and liable to be buried in sand. Fresh water is supplied at the wharves. No fire brigade; police have a small hose. The town seems

liable to be easily destroyed by fire, but this would not necessarily endanger the wharves. Complete drainage system. *Supplies*: about 1,000 tons of coal kept in stock. Steel oil storage tank of 1,500,000 gallons capacity for distribution of oil to railway, which has 6,500-gallon tanks along it. Fresh meat, vegetables, and fruit are plentiful. *Cables* to Vera Cruz and Tampico, and to Galveston; the cable station is about 800 yds. W. of the river entrance.

Port.—The bar of the river has been dredged, and the mouth trained by two converging breakwaters, of which the western is about 3,840 ft. long, and the eastern, reported in 1916 to be dilapidated, about 4,500 ft. A channel with 33 ft. depth over a minimum width of 330 ft. is supposed to be kept dredged up to the port, but dredging is intermittent. Anchorage is 6–7 fathoms off the town. Total wharfage fronting the river, 5,243 ft., comprising 7 connected wharves with a minimum depth of 27 ft. alongside; no. 1 wharf is the customs wharf, and is of timber; nos. 2–7 are timber-decked on steel piles and framing. Each wharf has three parallel railway tracks and connexion with the railway yards, and a large warehouse behind it. There are 18 electric 3-ton travelling cranes, 30 1-ton electric capstans, and, on the customs wharf, 5-ton and 10 ton steam travelling cranes.

The Coatzacoalcos River is navigable by vessels drawing at least 17 ft. for 20 m. up to MINATITLAN, where is the Mexican Eagle Company's refinery, with a capacity of at least 15,000 barrels a day. Minatitlan is connected with the main Tehuantepec Railway by a branch line. The river is navigable for smaller vessels much higher up, and so are some of its tributaries (see p. 26).

Puruandiro, State of Michoacan, 243 m. W. of Mexico City. Pop. 8,900. *Situation*, at foot of mountains. A regularly built town, with a municipal palace, a parochial church, and a Santuario de Guadalupe on the summit of a hill near by. On the outskirts of the town are hot baths, frequented by sufferers from skin diseases, &c., and not far away are the hot springs of Simbambaro. There are a large number of

orchards near the town. *Industries* : local manufactures of brandy, soap, cotton goods, shoes, beer, &c. *Communications* : by diligence-road (7 hrs. : see Appendix II, Route 58) to Penjamo (which see), railway station.

Queretaro, capital of State of Queretaro, 153 m. NW. of Mexico City.¹ Pop. 35,000. Alt. 5,947 ft. *Situation* : on fairly level site in valley of Queretaro river, surrounded by low hills. The river runs through the N. part of the town from E. to W., but is not navigable. The surrounding country is agricultural. The town, which is strongly Roman Catholic, quiet and unprogressive, measures about $\frac{1}{2}$ m. square. There are many old houses, with low-pitched tiled roofs in the outlying parts, and a few modern buildings. The streets are irregular, and rather narrow ; the side-walks are fairly good, but the road surface bad. The chief business centre is the Plaza Zenia, where the cathedral stands, and where there is a Sunday market. The municipal palace, in the Plaza de la Independencia, was once the home of Corregidora Dominguez ; the church of Santa Rosa (in Calle de Santa Rosa), the government palace, in Calle de San Agustin, and part of the large convent church of Santa Clara, in the Jardin de Santa Clara, are early work of Tresguerras. There are several other old convents and churches, a theatre, several markets, a hospital, and almshouses. *Industries* : distributing centre to district of moderate purchasing power ; cotton manufacture ; chief mills are the Hercules, in San Pedro de la Cañada, la Purissima, and San Antonio. Also sweetmeat, tobacco, hat, and soap factories, distilling, &c. Opals are found in the neighbourhood and sold in the town. The water-power, which is not very great, has been developed by the Queretaro Hydro-Electric Co., who have canalized the San Juan river, and dammed the Tequixquiapam springs to provide an artificial waterfall. *Roads* : see Appendix II, Routes 28, 39, 59, 66, 69, 70, 71, 73, 74. *Railways* : facilities good. Main lines of National and Central give alternative routes to Mexico City and the U.S.A. Station 1 m. SW. of

¹ Plan of Queretaro in case accompanying this volume.

town. See Appendix III, Sections vi, vii. *Tramways* : electric, run to station, and to suburbs of San Pedro de la Cañada, Pueblito, Amascala, &c. *Electric light*, by the Hydro-Electric Co., with a station on the E. side of the Alameda. Current in street mains of 2,200 volts, transformed down to 220 volts by transformers, usually placed on the flat *azotea* roofs. *Water-supply* : from reservoir on neighbouring hills ; a few hydrants near the plaza. An old aqueduct, 5 m. long, comes from San Pedro de la Cañada to the Plazuela de la Cruz, and brings good drinking-water.

SAN PEDRO DE LA CAÑADA, 5 m. NE. of town, is a village of about 2,000 inhabitants, a large number of whom are employed at the cotton mills. It is surrounded by high hills, and contains fine hot springs and baths. PUEBLITO, NW. of the town, has a celebrated wonder-working image in its church. About 1 m. W. of the town is the Cerro de las Campanas where the Emperor Maximilian fell with Miramon and Mejia ; there is a chapel on the summit.

Salamanca, State of Guanajuato, 207 m. NW. of Mexico City. Pop. 13,500. Alt. 5,646 ft. *Situation* : on wide plain subject to floods, on right bank of Lerma River, in fertile agricultural district. There are an ornate church, a large penitentiary, and a hospital. *Industries* : agricultural centre, manufacture of woollen goods (several mills), pottery, and gloves. *Roads* : see Appendix II, Routes 28, 55. *Railway* : Central. Also short line (50 m.) from Gonzalez junction via Salamanca to Garal del Valle. See Appendix III, Section vi. No piped water-supply or drainage system.

Salina Cruz, port, State of Oaxaca, 506 m. SE. of Mexico City.¹ Pop. 7,500. *Situation* : on the Pacific coast on Salina Cruz Bay at the head of Gulf of Tehuantepec. The town lies in a semicircular basin of low hills open on the south to the harbour and sea. It was built about 1908 to replace the old village, which was removed to make room for the inner basin of the harbour. Site is Federal property, and in 99 years all buildings revert to the Mexican Government. The town is

¹ Plan of Salina Cruz in case accompanying this volume.

laid out on a rectangular plan, extending northward from the east end of the harbour. It is planned to cover 2 sq. m., but at present consists of two unpaved streets, each 70 ft. wide, connected by cross-streets of same width. Half the buildings are of timber and one-storied, and half are of stone, including harbour office, post office, school, banks, and several hotels. The hospital, belonging to railway company, is a one-storied wooden building. Town is healthy. *Industries*: mainly trade either from Soconusco district or trans-isthmian. The latter, chiefly sugar from Hawaii, has declined since opening of Panama Canal. Cartridge and smokeless powder factories reported in 1909, but not mentioned since. *Road*: see Appendix II, Routes 89, 94. *Railways*: Tehuantepec National to Puerto Mexico, joining Pan-American line at Gamboa, and Vera Cruz al Istmo line at Santa Lucrecia. See Appendix III, Section xxx. Railway station near north end of town. Small repair shops: large ones at Rincon Antonio, 62 m. N. along railway. Railway sidings in town and port have about 18 m. of track. *Electric lighting* for town and port. Power station, also for dry dock and cranes; one-storied brick building on W. of dry dock. *Water-supply* from Rio Tehuantepec, 15 m. E. of town: good and ample. Laid on to all houses and to wharves. Town reservoir has capacity of half a million gallons. Good drainage system. No fire brigade. *Supplies*: Coal supply small and uncertain. Stock of 5,000 tons or less of American coal kept by railway in yard adjoining round-house. Government stock of uncertain quantity, also American, but used to be Welsh. Two large oil tanks, each with a capacity of 1,200,000 gallons, beside railway east of small hill behind port, the one a mile N. of the other. Oil laid on to dry dock and wharves in 4-inch pipe. *Cables* to San José and Panama. Cable station 800 yds. east of harbour. *Wireless telegraph* on hill N. of harbour.

Port.—The harbour consists of two parts: an outer harbour protected by two curving breakwaters, and an inner harbour, which forms the port. Both are tidal. The outer harbour has an area of about 138 acres, but the eastern and western ends

are shoal and unnavigable. The inner harbour, when complete, will have an area of 69 acres. Minimum depth proposed for both basins was $5\frac{1}{2}$ fms., but this can be maintained only by continuous dredging. Actual depth considerably less, and both harbours reported to be shoaling. Further works proposed include N. wall to inner basin with ten piers. Harbour built by Messrs. S. Pearson & Sons : now property of Federal Government. Outer harbour protected by E. breakwater 1,100 yds. long, and W. breakwater 630 yds. long. Opening between breakwaters 656 ft. wide, with a channel 278 ft., with a reported depth of not over $3\frac{1}{2}$ fms. Inner basin entered by passage 100 ft. wide, crossed by two swing bridges operated by electricity. Deep water in inner basin not over 200 yds. wide. Wall between outer and inner harbours forms wharf 1,000 yds. long and 76 yds. wide, alongside which are six berths. Railway tracks (standard gauge) and six large warehouses on wharf. Eighteen electric cranes of 3-ton capacity each, one 30-ton steam crane in poor repair, and electric capstans. Dry dock, 664 ft. long, with 2 steam cranes of 5-tons and one of 10-tons capacity. One tug of 400 h.p.

Saltillo, capital of State of Coahuila, 569 m. NNW. of Mexico City.¹ Pop. 40,000. Alt. 5,212 ft. *Situation* : on a fairly level site in an alluvial valley almost surrounded by mountains (which are most open towards the N.), and sloping gently from S. to N. The country is agricultural and mining, with a few manufactures in the neighbourhood. The town, which is somewhat irregular, measures about $1\frac{1}{2}$ m. by 1 m. and has a number of open spaces ; the streets, which are 30 to 40 ft. wide, are of earth and rough stones. The chief buildings, the government palace, cathedral, theatre, casino, &c., all lie close together in the E. part of the town. *Industries* : an active commercial town, the centre of a mining industry, with cotton and flour mills, cottonseed oil-works, engineering works, and breweries ; crude rubber is extracted from the *guayule* shrub, and good woollen *sarapes* are made. Large fair, attended by many Indians, in October. *Roads* :

¹ Plan of Saltillo in case accompanying this volume.

see Appendix II, Routes 20, 40, 100, 102, 103, 107. *Railways* : Central, from Mexico City to U.S.A. Station on W. outskirts of town. Also Coahuila and Pacific line, to Torreon (190 m.), station to N. of town ; and Coahuila and Zacatecas line to Concepcion (78 m.), station next Central station. See Appendix III, Sections vii, viii. There are no tramways. *Electric light*, with current generated at 3,000 volts, and transformed down to 210 volts by transformers on poles in the streets. The electric light station is in an isolated position outside the town ; there are two plants, one old and disused. *Water-supply* : municipal, by gravity, from two sources : (1) a perennial spring about 8 m. S. of a reservoir, to which the water flows by gravity through pipes ; (2) a spring on the Buenavista hacienda, 5 m. S. of the town, piped to a large reservoir S. of town and about 651 ft. above its southern part. The supply is never very large, considering the size of the town, since the pipes are too small, but it is constant ; it is, however, shut off at night in time of drought. The pressure varies very much. There are 14 hydrants at the corners of the chief streets. The police have an old manual fire-engine, and hose.

Salvatierra, State of Guanajuato, 195 m. NW. of Mexico City. Pop. 10,200. Alt. 5,736 ft. *Situation* : on a gentle hill on banks of Lerma River, in the fertile Salvatierra valley. Near the town the river forms a fall, and there are also other falls, providing water-power for the mills. The town is surrounded by fruit-gardens, particularly in the San Juan suburb to the S. The climate is hot, and dysentery and fever are common. The streets are irregular. There are a municipal palace, a parish church, and a second-rate hospital. *Industries* : cotton and wool mills, blanket factories. *Roads* : see Appendix II, Routes 65, 67. *Railway* : National. Station $\frac{1}{4}$ m. from town. See Appendix III, Section xi. *Tramways*, to station. *Electric light* installation, old-fashioned drainage system. *Water-supply* : piped from river. Supply often muddy. Drinking water is brought on mule-back from Angostura and Urireo springs.

San Andres Tuxtla, State of Vera Cruz, 391 m. SE. of Mexico City. Pop. 10,000. Alt. 7,972 ft. *Situation*: at foot of San Andres Mt. The climate is healthy, but sanitary conditions in the irregularly built town are bad, and fever and dysentery are common. *Industries*: commercial and industrial town, with busy market, several tobacco factories. *Road*: see Appendix II, Route 131. *Railway*: Vera Cruz and Isthmus, branch from El Burro. See Appendix III, Section xxv.

San Cristobal de las Casas, old capital of Chiapas, 62 m. E. of Tuxtla Gutierrez. Pop. 13,500. Alt. 7,020 ft. *Situation*: in fertile valley, in agricultural district. The town, which is the seat of a bishop, possesses a cathedral, a municipal palace, and a hospital. *Industries*: agricultural centre, with an Indian market, where fruit, home produce, cloth, &c., are sold. Boot, sugar, and alcohol factories. *Communications*: nearest railway station at Jalisco, 149 m. away by a good road. See Appendix II, Routes 96, 97, 98. There are no tramways or drainage system, but there is an electric light installation. *Water-supply*: no piped drinking-water supply, in spite of the abundance of springs in the neighbourhood. Water is obtained from the Amarillo river, and from wells, and typhoid and enteric occur, in spite of the comparatively healthy climate.

San Juan Bautista, capital of State of Tabasco, 12 m. from port of Frontera. Pop. 12,000. Alt. 33 ft. *Situation*: on banks of Grijalva river, which is navigable to this point, on alluvial soil in tropical agricultural country. The town possesses a cathedral, with a much-venerated image, a government palace, a large theatre, two markets, and a hospital, and is celebrated as the first spot visited by Cortes in Mexico. *Industries*: considerable foreign trade from Frontera, many business houses in town. Local manufactures of soap, cigars, cloth, &c. *Roads*: see Appendix II, Routes 96, 132, 134. *River communications*: steamboats, to Frontera, Jonuta, Monte Cristo, Balancan, Tenosique, &c. *Tramways*: animal traction, run to several suburban towns. See Appendix III,

Section xxxiii. *Electric light* installation, with a good plant. *Water-supply*: pumped by electric pumps from Grijalva river, and filtered.

San Luis Potosi, capital of State of San Luis Potosi, 327 m. N. of Mexico City.¹ Pop. 83,000. Alt. 6,123 ft. *Situation*: on almost level site on small plain in volcanic country, surrounded except on N. by low hills. The town is remarkably well built and well kept for Mexico; the buildings are solid throughout the town, which measures about 2 m. by 1 m., and there are a number of 3 and 4 stories in the central part, which is very closely built. The streets are rather narrow, but in the centre the road-surfaces, of stone or cement, are good. The chief shops are in Calle Hidalgo. The town is the seat of a bishop, and there are a number of churches, chief among them the cathedral, with a sumptuously decorated interior, in Plaza Hidalgo, and Nuestra Señora del Carmen, in Plaza de Morelos; many churches have tile-covered domes. There are a fine theatre, a government palace, a penitentiary, and two markets. *Industries*: distributing centre for district, which is largely agricultural, and partly mining, including a trade in agricultural machinery, mostly from U.S.A. government railway shops, a large smelter outside the town; match, candle, shawl, wool and cotton material, sweetmeat factories, &c. Flour-mills, brewery. *Roads*: see Appendix II, Routes 41, 46, 60, 70, 102, 113, 114. *Railways*: very good facilities. Central, main line, and junction for lines to Aguascalientes and Tampico. Station on W. side of town, 5 min. walk from chief plaza. *Tramways*: electric, operated by the San Luis Potosi Tramways Co., a British company, run to station and suburban towns (see Appendix III, Section vii). *Electric light*: streets fairly well lit. *Water supply*: from large reservoir formed by a dam across a valley some distance from the town. Water used for irrigation as well as for domestic supply. Hydrants at corner of each street. Supply constant.

San Miguel de Allende, also called Allende, State of Guana-

¹ Plan of San Luis Potosi in case accompanying this volume.

juato, 219 m. NW. of Mexico City. Pop. 10,000. Alt. 5,955 ft. *Situation* : on slope of Mt. Moctezuma, overlooking Laja valley. The hillside is laid out in terraces, with flower-beds and stone walks and steps, and near the summit is a hot spring, El Chorro, with bath-houses, which irrigates the gardens of the town. The climate is cool and damp. The town is noted for some remarkable monumental architecture by a native architect, Gutierrez ; in particular the church of San Miguel, a conspicuous landmark, and that of La Concepcion. The place is named after Ignacio Allende, who was born here. *Roads* : see Appendix II, Routes 39, 61. *Industries* : mining, cotton mills, *rebozo* and *sarape* factories, potteries, tannery. *Railway* : International. Station 2 m. from town. See Appendix III, Section viii. *Tramway* : to station. Electric light installation, and drinking-water supply.

Santa Rosalia (often called Camargo, from the district in which it is situated), State of Chihuahua, 900 m. NW. of Mexico City. Pop. 6,000. Alt. 4,086 ft. *Situation* : in centre of agricultural region, producing fine crops of alfalfa, with valuable silver mines. The straggling town stands on a low bluff. It contains the ruins of an old fortress ; 3 m. away, in the rich valley of the Florido river, are some hot springs, which were known in pre-Spanish times for their curative properties, particularly in cases of rheumatism. *Industries* : silver mining and agricultural centre. Flour and cotton mills, smelting works, ice and sweet factories. *Road* : see Appendix II, Route 17. *Railways* : Central ; station to W. of town. See Appendix III, Section vi. No drainage or piped water-supply.

Santa Rosalia, port, territory of Lower California, on Gulf of California, 75 m. SW. by W. of Guaymas. Pop. 10,000, mainly Mexicans and Indians, with a few French and Belgian. *Situation* : on a rugged barren coast at the mouth of Santa Rosalia cañon. Behind the town the hills rise to heights of 2,000 to 3,000 ft. The port and town were built and are owned by the Boleo Copper Company (French). Practically the whole population is engaged in the copper mines or in

shipping ore. Town on a rectangular plan. All buildings are timber. Town divided into three parts : (1) Francia, the most northern, with administrative buildings, hospital, and houses of French residents ; (2) El Pueblo, with smelting furnaces, stores, and Mexican quarter ; (3) Mexico, to S., solely a military post. *Supplies* : large quantities of coal are imported from Europe. Oil fuel in stock. Most food imported from San Francisco. *Water-supply*, good but not plentiful, brought from Santa Agueda, 2 m. distant, in aqueduct, and turned on only from 11 a.m. to noon. No water in vicinity. *Electric lighting* : power station supplies light for town and port and power for mining machinery. Drainage works good. *Wireless* station. *Railway* : The Boleo Copper Co. has a narrow-gauge line $26\frac{3}{4}$ m. long, connecting the mines.

Port.—Harbour is entirely artificial and covers about 40 acres ; rectangular in shape, protected by four breakwaters, with entrance on SE. Navigable channel in entrance 90 ft. wide. Harbour dredged to $5\frac{1}{4}$ fms. in E., but less than 4 fms. in W. Vessels lie alongside breakwater : also wooden jetty with 25 ft. alongside. Railway tracks to port from mine and furnaces. Ample electrical machinery for handling cargo.

Silao (Silao de la Victoria) State of Guanajuato, 238 m. NW. of Mexico City. Pop. 14,000. Alt. 6,069 ft. *Situation* : at foot of Cerro del Cubilete, on edge of rich agricultural region. Busy market in the Plaza Principal. About 6 m. distant are some hot springs, called Aguas Termales de Coman-gillo, and celebrated locally for their curative properties. Hospital, orphanage. *Industries* : celebrated for the 'open-work' done by the women, in factories and in their own homes. Agricultural centre. Hat and shoe factories. *Roads* : see Appendix II, Routes 28, 47, 60, 64. *Railway* : Central. Junction for Guanajuato branch. Trains from same station. See Appendix III, Section vi.

Tampico, port, State of Tamaulipas, 602 m. NE. of Mexico City.¹ Pop. 35,000 (reported to have been increased in April, 1917, by some 5,000 refugees from the interior). *Situation* :

¹ Map of Tampico and Panuco mouth in case accompanying this volume.

on N. (left) bank of the Panuco River 5 m. from its mouth, occupying an exposed low-lying site in an alluvial plain, between the river and Laguna Carpinteros to the N. Laguna de Chairel, through which the Tamesi flows to join the Panuco, lies to the NW., and the district is marshy. The lagoons and marshes breed mosquitoes, and the town is not healthy. The banks of the rivers at the town are low. Part of the town used to be subject to inundation, and it has been necessary to raise some of the lowest land to 8 ft. above sea-level. The most elevated part of the town rises from 20 to 50 ft. towards the W. and NW., where there are principally residential quarters. Parallel streets lead up at right angles to river bank and Tamesi canal, and are crossed by others at right angles. They are generally 40–50 ft. wide. The business quarter lies behind the Fiscal wharf (see below). Principal square : Plaza de la Constitucion. Principal streets are asphalted ; surface of others is poor. Principal buildings include the parochial church with two towers, municipal buildings, court-house, post office, and market. Civil and military hospitals. Building construction is on the whole less massive than usual in Mexican towns, and construction partly of timber is common, though there are some modern well-built business houses. The oil companies (see below), finding living accommodation scanty and rents prohibitive, have in many cases erected offices, residences, and apartment houses for their foreign employees, and there are at least 1,000 such buildings in the vicinity of Tampico. Most buildings in centre of town are of two stories, with some of three to five stories ; in the outer parts one-storey buildings are usual.

Industries : mainly connected with the oil-fields of northern Vera Cruz and Tamaulipas (see p. 132), for which Tampico is the principal exporting centre. Also export trade in cattle, hides, and skins, fibres, chicle, rubber, sarsaparilla, vanilla, beeswax, honey, fruits, vegetables, nuts, coffee, &c. *Roads* : see Appendix II, Routes 109, 111, 114 C, 115 A. *Railways* : National (1) to La Barra at mouth of Panuco, 6 m. ; (2) to San Luis Potosi, westward, connecting these with the Mexican

system generally, and affording a devious route to Mexico City; (3) to Ciudad Victoria and Monterey north-westward; (4) a projected direct line to Mexico City, to cross the Panuco by a steel suspension drawbridge at Tamos, above Tampico, reported two-thirds built in 1915; the line is built some 25 m. S. of the river. The Tampico-Panuco Railway, starting from S. bank of river opposite Tampico (ferry), is built for 39 m. See Appendix III, Sections vii a, ix. *Tramways*, electric, in town, with extension to La Barra bathing beach, worked by Tampico Electric Light, Power, and Traction Co., a British concern: 15 cars. *Cable* to Vera Cruz. *Electric lighting* by the same company, in streets and for private use, except in poorer houses, where oil is used. *Water-supply*: municipal, not satisfactory for domestic use, drawn from Tamesi River above Chairel Lagoon, by two pumps, worked by two steam boilers of 65 h.p. into a 14-in. main, which carries water to a reservoir of $3\frac{1}{2}$ million gallons capacity, 108 ft. above and 10 m. NW. of the town, at Camalote; 14-in. main to distributing network of 5-in. pipes; 2-in. valve hydrants at street corners. Service nominally unlimited, but pumping liable to interruption. Volunteer fire brigade with old engine and steam fire-float. *Other supplies*: coal, usually about 1,000 tons, in hands of German firm; oil stocks on the fields and at Tampico, beginning of 1917, nearly 8,000,000 barrels; fresh provisions available if railway from San Luis Potosi is open.

Port.—The Panuco enters the sea between two jetties about 1,600 yds. long and 1,000 ft. apart, which are dilapidated. Constant dredging and improvement of the jetties is needed to maintain a depth of 30 ft., and disputes have ensued on this subject between the Government and the oil companies. At N. side of river mouth is LA BARRA, a small town, with light-house, telegraph, custom-house, &c., and hotels, the place being a bathing and fishing resort. Up-river as far as Tampico, and beyond it, is a succession of oil companies' tank-farms, with wharves, refineries, and other works, and in some instances termini of pipe-lines from the oil-fields (see map).

There are also, on the N. bank (1) railway coal wharf at **TALLERES**, and export wharf at **DOÑA CECILIA**, $2\frac{1}{4}$ – $2\frac{1}{2}$ m. upstream, each about 620 ft. long, with depths of 18–22 ft. alongside; (2) coal wharf at **ARBOL GRANDE**, 3 m. upstream, 750 ft. long, 25 ft. depth; (3) railway wharf, 4 m. upstream, 553 ft. long, with lumber wharf above; (4) Fiscal or custom-house wharf, Tampico town, of steel and concrete, 2,600 ft. long, with custom-house, steel shed, 30-ton electric crane, and railway tracks connected with the railway yards behind; depth alongside, 20 ft. or more. The Panuco river is used for barging oil from the Panuco field (for navigation, see p. 25). At the beginning of 1915 there were 6 tugs and 9 stern-wheel tow-boats (aggregate h.p., 6,125), and 56 barges employed in this traffic. There are estimated to be 125–150 motor boats, and there are many native canoes fitted with small gasoline motors.

Tapachula, State of Chiapas, 739 m. SE. of Mexico City. Pop. 8,000. Alt. 590 ft. *Situation*: at foot of Tacamah volcano on Coatan river. The town has a fine tropical *alameda*. *Industries*: agricultural centre. Position near Guatemalan frontier is increasing the commercial importance of the town. *Road*: see Appendix II, Route 94. *Railway*: Pan-American. See Appendix III, Section xxxi. Branch line to San Benito was to be built in 1918. *Electric light* and power supplied by Tapachula Light and Power Co., who have canalized the water from the river for $1\frac{1}{2}$ m. *Water-supply*: with the exception of that of a well near the town, the water is bad, and causes frequent cases of enteric.

Taxco, State of Guerrero, 94 m. SW. of Mexico City. Pop. 3,000. Alt. 5,000 ft. *Situation*: on steep slope of Mt. Atchi, at foot of cliffs. The town is old and picturesque; the red-tiled houses are intersected by narrow, tortuous, and cobbled streets, with the large and ornate church of San Sebastian and Santa Prisca rising from the centre, and commanding a wide view from its towers. Ravines, filled with water in the rainy season, run through the town, and there is no vehicular traffic. *Communications*: about 5 hrs.' ride

from Iguala, and 4 hrs.' from Naranjo, station on Cuernavaca line. See Appendix II, Routes 75 D, 83. *Water-supply* : aqueduct from springs about 3 m. to W. of town.

Tehuacan, State of Puebla, 237 m. SE. of Mexico City. Pop. 10,000. Alt. 5,408 ft. *Situation* : in cereal-growing region in a bare valley, watered by mountain streams, near base of Colorada hills. The town is regularly planned, and contains several old domed churches, and a hospital. There are a number of hot springs in the neighbourhood, with water similar to that of Carlsbad, which make the place a popular resort. The springs and baths of San Lorenzo are $1\frac{1}{4}$ m. from the town. The largest spring has a capacity of about 3,250 gallons per minute. *Industries* : growing of pomegranates. Quantities of water bottled at springs. Cotton and flour mills, sugar and sweetmeat factories. Market for sacks, rope, &c., made by the natives from fibre ; also hats and mats. *Roads* : see Appendix II, Routes 86, 127. *Railway* : Mexican Southern. Station $\frac{1}{2}$ m. W. of town. Branch line to Esperanza (31 m.) on Mexican railway. See Appendix III, Section xxvii. *Tramways*, running to station.

Tehuantepec, State of Oaxaca, 499 m. SE. of Mexico City. Pop. 11,000. Alt. 125 ft. *Situation* : in wide gorge, with hills of La Cueva, Santa Maria, Tigre, Padre Lopez, and La Vixana to E. and W., on bend of Tehuantepec river. The attractive town, about 1 m. square, is much subject to earthquakes. The central plaza, where the municipal palace is, and the adjoining market form the chief business quarter. The streets are from 40 to 60 ft. wide. The town is the seat of a bishop, and contains many churches, and an old fortress, which was Diaz's head-quarters during the war of French intervention. There are hot springs in the neighbourhood. The native women of the town are famous for their beauty, their remarkable costumes, and their commercial enterprise. The town is unhealthy, and the houses insanitary ; tuberculosis, enteric, and fever are common. *Industries* : gourds (*jicaras*) are made, which resemble the Uruapan ware. Sugar factories. *Roads* : see Appendix II, Routes 89, 94, 95.

Railway: Tehuantepec. Trains run for some distance through principal streets. See Appendix III, Section xxx.

Water-supply: from artesian wells. The river water is often impure.

Tepic, capital of Nayarit State (formerly Tepic territory), 562 m. NW. of Mexico City. Pop. 16,500. Alt. 3,000 ft. *Situation*: on broad plain near Sanganguey volcano, 10 m. distant; the small Tepic river runs past town, and joins Santiago river. The town is clean and healthy, though fever is common near the coast; it is about $\frac{3}{4}$ m. square, and closely built, the principal streets being from 40 to 50 ft. wide. There is a park, and the principal gardens are the Jardines San Roman, Zaragoza, and Loma de la Cruz. There are a municipal palace, a cathedral, the Templo de la Cruz, a large theatre, a penitentiary, and a hospital. *Industries*: centre of rich agricultural region, cotton mills, sugar and alcohol factory. *Roads*: see Appendix II, Routes 26, 27. *Railway*: present terminus of Southern Pacific. See Appendix III, Section i. Diligences to neighbouring places. *Water-supply*: from reservoir formed by dam across valley on outskirts of town. The larger part of the supply is used for irrigation, but there is an 8-in. pipe to the town. There is a frequent shortage of water, and there are no hydrants.

Teziutlan, State of Puebla, close to Vera Cruz border, 187 m. E. of Mexico City. Pop. 15,000. Alt. 5,600 ft. *Situation*: in agricultural and mining district, with Teziutlan mountains to S., Atoluca mountains to N., Ocotepec and Quetzalan mountains to E., and Chinautla mountains to W. To SE. is the curiously shaped hill of Tzompatilan. The town is fairly healthy, though sanitary conditions are bad; the streets are hilly and irregular. The Carmen church stands on a hill, and commands a good view from the towers. There are a municipal palace, a parish church, a theatre, and a hospital. *Industries*: agricultural and copper-mining centre; the chief company is the Teziutlan Copper Mining and Smelting Co., with a large smelter near the mines. Considerable trade with Puebla and other towns, but very little

manufacture, in spite of the existence of abundant water-power. *Roads* : see Appendix II, Routes 120, 122. *Railway* : Mexican Eastern (Interoceanic system). See Appendix III, Section xvi. *Water-supply* : good and abundant.

Tlacotalpam, State of Vera Cruz. Pop. 6,000. *Situation* : in cattle-raising and agricultural region, at junction of San Juan and Papaloapan rivers. The town, which was an important Indian post in pre-Spanish times, is a small quiet place, full of palm-trees, with streets running along the river, flanked by houses of oriental type. The main plaza contains two churches and a municipal palace ; there are a hospital and a good market. *Industries* : soap factory, and some unimportant manufactures. *Communications* : steamboats until recently belonging to the Navigation Department of the Vera Cruz Railway on Papaloapan river to Tuxtepec and Alvarado (which see), and thence by rail to Vera Cruz. Mail boats run to Tuxtepec. For road, see Appendix II, Route 130.

Tlaxcala, capital of State of Tlaxcala, 93 m. E. of Mexico City. Pop. 2,800. Alt. 7,500 ft. *Situation* : in small valley, on banks of rapid Zahuapan river, surrounded by hills. The town, now unimportant, was once a great Indian settlement, and there are ruins of Indian fortifications on the neighbouring hills. On the terraced hillside is the old church of San Francisco, and on another hill about 1 m. SE. of the plaza is one of the most celebrated shrines of Mexico, the Santuario de Ocotlan, with a highly decorated church. There are a penitentiary, near San Francisco church, a government palace, and a market. *Roads* : see Appendix II, Routes 119, 125 B, 133. *Railway* : Tlaxcala line, branch from Santa Ana, on Mexican Railway. See Appendix III, Section xxiii. *Electric light* installation. *Water-supply* : from an aqueduct and fountains.

Toluca (Toluca de Lerdo), capital of State of Mexico, 45 m. SW. of Mexico City.¹ Pop. 31,000. Alt. 8,761 ft. *Situation* : in extensive fertile valley, sloping gently to the S. and E., with hills to the N. and W. The town is modernized,

¹ Plan of Toluca in case accompanying this volume.

well drained and healthy, though, owing to the altitude, diseases of the respiratory organs are common. The streets, which vary in width, the principal ones being wide and those in the residential districts quite narrow, are straight and clean, several running parallel with the Xicualtenco river, which flows through the town. The chief streets are the Avenida de la Libertad and the Avenida Independencia, which connect the centre of the town with the National railway station; the chief plaza is called Plaza Principal or Jardin del Zocalo. The most important gardens are Colon, Morelos, the old Alameda, and Plaza de los Martires. The buildings, which are largely of stone, are mostly of massive construction and there are a number of 2 and 3 stories. Many rich people live part of the year in Toluca and part in Mexico City, and Toluca derives considerable benefit from its nearness to the capital. There are a government palace, in Plaza de los Martires, several churches, a large government hospital, a maternity hospital, a market, and several monuments of Hidalgo, Columbus, &c. *Industries*: commercial and manufacturing centre; products sold in Mexico City. Brewery of the Toluca and Mexico Brewing Co. Wool, flour, and cotton mills. Timber yard. *Roads*: see Appendix II, Routes 51, 75 E, 84. *Railway*: National, Gonzalez Junction-Mexico City line. Station on E. outskirts of town, 1 m. from chief plaza. Toluca-Tenango line (station S. of town), and San Juan de las Huertas line (station W. of town), run frequent trains to suburban towns. See Appendix III, Section xi. *Tramways*: animal traction, run to stations and to several neighbouring villages. *Water-supply*: from springs on the Pila, Garcesa, and San Mateo *haciendas*, about 3 m. from the town; the water is piped to a reservoir in Calle de la Garcesa, near the National station, and only some 30 ft. above the business quarter. Stand-pipes and underground hydrants in town.

Torreon, State of Coahuila, 706 m. NW. of Mexico City.¹ Pop. 34,000. Alt. 3,790 ft. *Situation*: in shallow valley

¹ Plan of Torreon in case accompanying this volume.

with low volcanic hills not far away, in productive Laguna district. Small river skirts town. Site practically level. The town is unlike the majority of Mexican towns, in that it is busy and thriving, and largely Americanized, and has grown very rapidly. The buildings are irregular in height, owing to the rapid substitution of two- or three-storied modern American buildings, often of flimsy construction, for the single-storied massive Spanish houses. There are a number of adobe houses and temporary erections of timber, sacking, and thatch in the outskirts. The streets are wide, with a fairly uniform width of 68 ft., but the side walks and road surfaces are bad, and very dusty. The Calle Rayon (138 ft. wide) forms a division between the present town and the area laid out for future expansion. The Plaza Mayor is the centre of the life of the place, and the best shops are in the Avenida Hidalgo. *Industries*: rich town, rapidly increasing in commercial importance. Large factory of Continental Mexican Rubber Co. Cotton and flour mills, foundries, important soap factory, ice factory, large smelter, brick works, &c. Distributing centre for agricultural district, where much cotton is grown, though the climate is too dry and the water-power too scarce for cotton-spinning on a large scale. The important manufacturing establishments are mostly near the station. *Road*: see Appendix II, Route 25. *Railways*: important centre. Junction of Central and International, to Durango and Monclova, with a line to Saltillo and Monterey. Joint station SW. of town. See Appendix III, Sections vi, vii, viii. *Tramways*: Torreon belt line encircles town. Also to the smelter, Lerdo (25 min.), and Gomez Palacio. *Electric light* installation. *Water-supply*: by private companies, from Nazas river about 1 m. from town, where a well has been sunk and the water is raised by electric pumps to a reservoir. Power from a power-station in the town at NE. corner of the junction of Calles Rodriguez and Allende.

LERDO, State of Durango, 25 min. by tram from Torreon on Nazas river. Pop. 8,000. Many people of Torreon live

in the town, because of the lower rents. The plaza is surrounded by ash trees, and there are a municipal palace and a market. *Industries*: dynamite and explosives factory, flour mill, foundry, cottonseed oil-works, &c. *Water-supply*: from wells.

Tulancingo, State of Hidalgo, 92 m. NE. of Mexico City. Pop. 10,000. Alt. 6,840 ft. *Situation*: in beautiful and fertile Tulancingo valley. An old town, with a cathedral and a hospital. *Industries*: manufacturing and agricultural centre, with important woollen mills. *Railway*: National, Telles-Honey line. Branch to Ventoquipa. See Appendix III, Section xv. *Water-supply* planned and drainage system under construction in 1911.

Tuxpan (or Tuxpam), port, State of Vera Cruz, about 135 m. NNW. of Vera Cruz. Pop. 4,500. Town is situated on N. (left) bank of Tuxpan River about 5 m. from the mouth, but there are settlements at the mouth (Tuxpan Bar) in connexion with the oil-pumping and loading stations, for which the port has become important (see p. 136). The Penn. Mexican Fuel Oil Co.'s sea-loading lines are S. of the bar, and are connected with a main pipe-line from the company's field at Alamo. The loading lines, in four pairs, run out to sea nearly a mile, to moorings in about 6 fms. The Mexican Eagle Co.'s lines are N. of the bar, in four pairs, with four loading berths, in about 6-7 fms. Twenty oil storage tanks, total capacity, 1,096,000 barrels, of this company at the bar; stocks between 400,000 and 600,000 barrels usually carried. No particulars are available concerning the other company's stock. The river has a bad bar with 5-7½ ft. of water. Wharf within the bar. River within bar about 4 cables wide, with depths of 14-18 ft. for about 25 m. From a point 1 m. within the bar there is a channel navigable by canoes through marshy lagoons northward to the Laguna de Tamiahua and Tampico. The construction of a canal has been undertaken, but its southern part is not in satisfactory condition. *Industries*: connected with the oil trade and trade in chicle, rubber, vanilla, dye-woods, hides, honey, &c. *Roads*: see Appendix

II, Routes 119, 120 B. *Railways*: only light lines in connexion with the oil business (see p. 137); no connexion with Mexican system. *Tramway*, animal traction, in Tuxpan town; doubtful whether still working. *Wireless* station, Tuxpan Bar, see p. 183. *Water-supply*: inadequate, from wells in yards of houses, at Tuxpan town; the settlements at the bar are supplied from Zapotal. *Hospital* at Tuxpan town; doctor appointed by U.S. Marine Hospital Service at Tuxpan Bar.

Tuxtepec, State of Vera Cruz. Pop. 4,000. Alt. 262 ft. *Situation*: among large plantations of tobacco, cotton, coconuts, &c., at head of steamer navigation on Papaloapan river. Pleasant, clean town. Considering the hot climate and the bad sanitary conditions, the state of public health is said to be better than might be expected, but fever and enteric are common, and epidemics of yellow fever occur occasionally; there is a small and unsatisfactory hospital. *Industry*: shipping. *Communications*: mail boats belonging until recently to the Navigation Department of the Vera Cruz Railways down Papaloapan river to Alvarado (which see). Passengers transfer at Tuxtepec to cargo or light-draught boats for up-river points. For road, see Appendix II, Route 92. Passengers transfer at Tuxtepec to cargo or light-draught boats for up-river points. *Water-supply*: from river, distributed by carts; frequently contaminated. Good springs 4 m. distant.

Tuxtla Gutierrez, capital of State of Chiapas, 662 m. S.E. of Mexico City. Pop. 10,000. Alt. 1,739 ft. *Situation*: in fertile plain in very rich district, on left bank of Chiapas or Mescalapa river. Town is quiet and characteristically Mexican, with squat houses and cobbled streets. The Paseo Joaquin Miguel Gutierrez is the centre of the town. The *feria de Guadalupe*, held in December, brings many visitors. The town is clean and not unhealthy, considering the deficient sanitary arrangements, though fever and enteric occur: there is no hospital. *Industries*: large market in market-place. Painting of gourds and calabashes forms a special industry. Cigar factory. *Communications*: nearest railway

station at Jalisco (87 m.), which is reached in $2\frac{1}{2}$ to 3 days on horseback or in a diligence by a good road. For roads, see Appendix II, Routes 93, 95-99. *Tramway*, to Chiapas. *Electric light*, from a small plant. *Water-supply*: piped from spring; good, but slightly alkaline. No drainage system.

Uruapan, State of Michoacan, 320 m. W. of Mexico City. Pop. 13,500. Alt. 5,576 ft. *Situation*: in very fertile coffee and sugar growing region, with mountains to S. Cupatizio river runs S. of the town, which is famed for its picturesqueness. The plazas of El Mercado, Kiosko, and the Jardin de los Martires stand at the top of a hill, with regularly built streets sloping away on all sides. The streets are cobbled but clean; many are planted with coffee and banana trees, and there are quantities of fruit trees, particularly mulberry trees, in the suburbs. Most of the houses have tiled roofs. Sanitary conditions are unsatisfactory, and result in epidemics of small-pox and scarlatina. *Industries*: centre of important agricultural and grazing district, and metropolis of the Indians of the country, who manufacture a lacquer-ware of gourds, called Uruapan ware. Good cotton mills, blanket, sugar, and tobacco factories. The Cupatizio river provides abundant water-power. *Road*: see Appendix II, Route 52. *Railway*: terminus of National, from Mexico City. Station $1\frac{1}{2}$ m. E. of town. See Appendix III, Section xii. *Tramways*: run to station by indirect route.

Valle de Santiago, State of Guanajuato, 238 m. NW. of Mexico City. Pop. 12,000. Alt. 5,630 ft. *Situation*: in fertile volcanic district, near Mt. Alberca, an extinct volcano with its crater full of water, and La Batea hills. Fever is prevalent. *Industries*: rebozo manufacture. The alkaline quality of the water employed is said to render the dyes more permanent than those used elsewhere. Trade with Salamanca, Guanajuato, and Mexico City. *Roads*: see Appendix II, Routes 55, 65. *Railway*: National, branch from Gonzalez junction (42 m.). See Appendix III, Section vi. *Electric light* installation, but no drainage system or piped water-supply, and the artesian wells in use are unsatisfactory.

Vera Cruz, port, State of Vera Cruz, 264 m. E. of Mexico City.¹ Pop. 45,000–50,000. *Situation* : on low alluvial plain bordering the Gulf Coast, the site being practically flat. The city is fronted by an artificial harbour (see below), and a good deal of land reclaimed when the quay was constructed is still not built upon. The main avenues of the central part of the city run SE. and NW., and reckoning in order from seaward the principal of them are : Avenidas Zaragoza, Independencia, Cinco de Mayo, Cortez, Hidalgo, Bravo, Guerrero, and Allende. The principal streets cross these avenues mostly at right angles. Three other main avenues, Denesa, Libertad, and Ferrocarril, strike southward from near centre of town. Main thoroughfares in central part are generally from 24 to 45 ft. wide and asphalted ; in outer parts they are somewhat wider, and their surface is bad. The town, much as it has been modernized, retains many picturesque old-fashioned buildings, and as a whole is unusually well built, especially for a coast town. The buildings in the central part are usually of two or three stories, of massive stone structure, with hard roofs. Behind the custom-house wharf are the custom-house, post and telegraph office, and terminal railway station. The cable office, however, is at the NW. end of Avenida de la Independencia. Some of the principal hotels face the quay ; others are mainly in or near the Avenida de la Independencia. Close to the custom-house are the city hall (*palacio municipal*), and the public library in the old church of San Francisco, whose tower, on the Calle Benito Juarez, used to serve as the light-house. The parochial church faces the Avenida de la Independencia, and flanks the south side of the Plaza de la Constitucion (Plaza de Armas), a busy centre. Behind the commercial wharf is the small fort or bastion of Santiago, and adjacent to it are the artillery barracks and the naval school. The military commandant's offices are at the SE. end of the Avenida de la Independencia ; adjacent are the gaol and military prison. Civil prison in Avenida de Allende. *Hospitals* : military hospital, Avenida Hidalgo ; San Sebas-

¹ Plan of Vera Cruz in case accompanying this volume.

tian, near artillery barracks; Loreto, Avenida Cortes, adjacent to military hospital; Beneficia Española, in SE. quarter; Centro Asturiano. Health conditions recently bad; tuberculosis diseases especially prevalent.

Industries: mainly connected with business of port. Exports (under normal conditions) principally ores, bullion, gold and silver; also coffee, skins and hides, vanilla and other tropical products. Imports, principally textiles, &c., machinery and metal goods, raw materials for manufacture, live-stock and animal produce, arms and explosives. Trade has recently fallen off greatly. New market (*mercado nueva*) near naval school; old market (*mercado antigua*) adjacent to city hall; slaughter-house near base of south-eastern breakwater. Fresh provisions are plentiful under normal conditions. *Roads*: see Appendix II, Routes 125 A, B, 126, 130. *Railways*: (1) Vera Cruz Rly. to Alvarado; (2) Vera Cruz al Istmo (Constitutionalist Rlys., Division del Istmo) to Santa Lucrecia; (3) Interoceanic Rly. to Mexico City via Jalapa, Oriental, San Lorenzo, &c.; (4) Mexican Rly. to Mexico City via Cordoba and Orizaba. See Appendix III, Sections xxiv, xxv, xvi, xxiii. These use the joint station of the Vera Cruz Terminal Co., with four covered platforms 600 ft. long, close behind Vera Cruz wharf (see below); railway yards extend from it along NW. side of town. *Tramways*: Vera Cruz Electric Light, Power and Traction Company's system, 7 m.; 14 cars (1914), dépôt in S. part of town (Avenida Libertad). *Wireless telegraph* station to S. of town (see p. 183). *Cables* to Galveston, Puerto Mexico, Frontera and Campeche, and Tampico. *Electric light and power*: the quay and town generally are supplied by the Vera Cruz Electric Light, Power, and Traction Co., a British concern, obtaining power from hydro-electric plant near Orizaba, 83 m. distant (see p. 144). *Water-supply*: public, serving practically the whole town, from Jamapa River, impounded at Tejar, about 12 m. distant, where are the pumping plant (2 large and 4 small steam pumps, daily capacity 165,000 gallons) and filters; supply runs from filters to clean water tank, thence pumped through 20-in.

main to distribution reservoir, 3 m. from town and 125 ft. above it ; thence through 12-in. main to 10-in. girdle round town, connecting with 4-in. supply network ; $2\frac{1}{2}$ -in. hydrants at all corners in central part of town. Volunteer fire brigade, with old engine and hose in bad condition (1909). *Drainage system*, modern, discharging through pipe built into masonry of NW. breakwater (see below), and thence across Gallega reef to sea. Large flocks of black buzzards (*zopilotes*) act as scavengers, and are protected.

Port.—Under normal conditions Vera Cruz is the principal port in Mexico. It faces eastward between Points Mocambo and Gorda. Here an area about 5 m. by 3 m. is surrounded by reefs with navigable channels between them, and good anchorage under their lee. About 800 yds. S. of Gallega Reef is Lavandera Reef, and off shore S. of Lavandera, Hornos Reef. Off shore W. of Gallega is Caleta Reef. These roughly define the limits of the artificial harbour, which has an area of about 540 acres and a depth at the entrance of 33 ft. ; depths of 22–30 ft. over most of the harbour. The harbour is enclosed by (1) the SE. breakwater, 2,995 ft. long ; (2) the NE. breakwater, 2,420 ft.—between (1) and (2) is the entrance, 853 ft. wide ; (3) Gallega reef, forming a natural protection as far as the foot of San Juan de Ulua, a massive structure begun in 1528, with arsenal, prison, &c. ; (4) the N. wall, built on the Gallega reef, 1,640 ft. ; (5) the NW. breakwater, 3,560 ft. Within the harbour there is an inner protection wall. The harbour frontage of the city consists of the town quay (*malecon*), about $1\frac{1}{4}$ m. long. This comprises (1) the commercial wharf, 1,970 ft., alongside which light-draught vessels berth and discharge ; (2) promenade wharf, 1,180 ft. ; (3) customs-house wharf, 1,800 ft. ; (4) Caleta wharf, 2,100 ft. From this quay piers project in the following order from S. to N. : (1) passengers' landing-stage, with sanitary station and baggage customs house adjacent ; (2) Fiscal mole, 590 ft. long, on steel piles, with masonry warehouses in rear ; (3) Vera Cruz wharf, 1,247 ft. long and 328 ft. wide, of concrete and rubble faced with stone, like the quay, with warehouses on it ; (4)

piers 5, 4, and 1, 428, 492, and 450 ft. long. Piers intended to bear intervening numbers have not been built ; in all, seven other such piers have been projected, as well as a coal wharf and a great sea-wall for the further protection of the N. side of the harbour from northerers. There is a full equipment of hydraulic cranes of 4, 10, and 20 tons, reported (1916) in indifferent repair. Railway tracks along town quay, Vera Cruz wharf, and piers. Floating pontoon lifting 1,600 tons, and one smaller for repair of tugs and lighters. Coaling (about 30,000 tons in stock) is done from No. 1 pier and from two hulks and lighters. Oil is also shipped at No. 1 pier, whence there is pumping connexion with two 42,000-barrel tanks on the N. side of the railway yards. The Vera Cruz Terminal Company (see above), a British concern, dealt with the handling and forwarding of traffic, but the working of the port was recently taken out of its hands by the Government. The harbour was constructed by a British firm, and through the terminal and electric companies, &c., British interests in the port are large.

Zacatecas, capital of State of Zacatecas, 439 m. NW. of Mexico City.¹ Pop. 26,000. Alt. 8,100 ft. *Situation* : in ravine at foot of Grillo and Bufa mountains, surrounded by arid hills. The city is irregular, and the streets very narrow, from 20 to 25 ft. (except the chief business streets, Calles de la Caja and de la Merced Nueva), steep, and frequently interrupted by stone steps ; where the roads are paved at all, they are roughly cobbled, and there is no wheeled traffic in the town. The town, which is one of the oldest in Mexico, is very closely built in the centre, and packed into the ravine. There are many churches, including the cathedral, in Calle de la Catedral, and Santo Domingo, close to it ; a municipal palace, in the Jardin Juarez, a theatre, in Calle de la Caja, a fine market, a penitentiary, and two hospitals, one on Mt. Calvario ; on the summit of Mt. Bufa, to the S. of the town, are a chapel with a famous miraculous image, and an observatory. The town is much exposed to winds blowing through

¹ Plan of Zacatecas in case accompanying this volume.

the gorge, and pneumonia is prevalent. *Industries*: distribution of necessities to surrounding country, which is entirely dependent on mining. Fine *sarapes* are made. Cigar and rubber factories, &c. *Roads*: see Appendix II, Routes 19, 30, 38–42. *Railway*: Central. Station on summit of hill to SW. of town, overlooking it and surrounding country. See Appendix III, Section vi. *Tramways*: small cars run to various parts of city and suburbs. Animal traction to top of hills, whence they return by gravity. *Electric light*: with current of 3,000 volts (transformed down to 220 volts in small transformer chambers) from the power station of the Zacatecas Light and Power Co., outside the town near the station. *Water-supply*: from wells and springs. No piped supply (except a very small one for domestic purposes) in existence in 1909, but a pumped supply, with 2 pumping stations and 2 reservoirs, was nearly complete.

GUADALUPE, an E. suburb of Zacatecas, which has a large church, is reached in 30 min. by tram along a tortuous street, with mines, smelters, and slag-heaps on each side. The extensive ruins of the ancient city of Chicomoztoc lie 36 m. to SE., on the Zuemada *hacienda*, at a height of 7,600 ft.

Zamora, State of Michoacan, 336 m. W. of Mexico City. Pop. 15,500. Alt. 6,397 ft. *Situation*: in beautiful valley of Zamora, on Duera river, in productive district. Many of the neighbouring landowners live in the quiet, strongly Roman Catholic town. It is somewhat damp and unhealthy: cases of leprosy occur. It is the seat of a bishop, and possesses a cathedral, and two hospitals. Most of the houses have tiled or shingled roofs. The road-surfaces are full of holes. *Industries*: agricultural centre, trade unimportant. The local manufactures—flour and saw mills, starch and sweetmeat factories, &c.—are mostly situated in the suburb of Jacona. *Roads*: see Appendix II, Routes 31, 36, 50, 56. *Railway*: National, branch from Yurecuaro (25 m.) on Irapuato–Guadalajara line. See Appendix III, Section xxix. *Tramways*: animal traction to station and several suburban towns.

Electric light installation, and *water-supply*, from Jacona, but no drainage system.

Zapotlan (Zapotlan el Grande or Ciudad Guzman) State of Jalisco, 486 m. W. of Mexico City. Pop. 18,000. Alt. 5,000 ft. Usual starting-place for the ascent of Mts. Colima and El Nevado. The old town was almost destroyed by earthquake in 1806. The place is poor and strongly Roman Catholic. Hospital. *Industries*: considerable trade, and agricultural centre. Alcohol and soap factories. *Road*: see Appendix II, Route 35. *Railway*: National, Guadalajara-Manzanilla line. See Appendix III, Section xxviii. *Electric light* installation. *Water-supply*: from springs, by iron pipes.

Zitacuaro, State of Michoacan, 192 m. W. of Mexico City. Pop. 9,000. Alt. 6,560 ft. *Situation*: on slope, surrounded by high hills. The parish contains a much-venerated statue. The town was one of the first to welcome the Revolution, and is known for its liberal spirit. *Industries*: agricultural. Flour mill, timber yard. *Road*: see Appendix II, Route 53. *Railway*: Michoacan and Pacific line joining the Mexico City-Uruapan line at Maravatio, 53 m. from Zitacuaro. See Appendix III, Section xi. No Federal telegraph connexion. *Electric light* installation, alternating current. *Water-supply*: piped from springs.

APPENDIX II

ROADS AND TRACKS

NOTE.—In the itineraries the status of localities other than ‘ranchos’ has been indicated whenever ascertainable. ‘City’ stands for *ciudad*, ‘town’ for *villa*, and ‘village’ for *pueblo*. In other cases, however, it has seemed preferable to retain the Spanish terms, e. g. *hacienda*, *rancheria*, *cuadrilla*, *comisaria*, &c., which are explained in Appendix IV.

Such expressions as ‘good road’ must be understood relatively: compare the general section on roads in Chap. VI.

Information regarding diligence services, unless otherwise stated, dates from 1914.

m. = miles. l. = left. r. = right.

ROUTE 1

LA PAZ—TODOS SANTOS (Lower California), about 75 miles

Direction S. No railway communication. The road is suitable for wheeled traffic. A diligence runs twice a week in each direction between La Paz, city, and Triunfo, village (about 45 m.), time 4 hrs. From Triunfo a track appears to go SE. to Buenavista and thence S. to San Jose del Cabo, town (about 125 m. from La Paz).

In 1912 a subsidy was granted by the Federal Government to the municipal councils of the southern districts of Lower California for the construction of roads. In the N. of the province an ancient trail leads from Calexico (U.S.A.) to the confluence of Hardy’s Colorado; near the river it is hemmed in by rocks and reduced at times to a narrow path. From the confluence a trail goes NNE. to Yuma (U.S.A.) and another WNW. to Campo. The central part of the peninsula is crossed by various trails, running approximately parallel with the coast line, some of which appear to have been converted into good cart roads.

ROUTE 2

YUMA (U.S.A.)—GUAYMAS (Sonora)

Direction SSE. Two routes are available.

(A) *Via Santa Ana.* The road is suitable for wheeled traffic. Diligences run twice a week between Caborca and Altar, and three times a week between Altar and Santa Ana. Between Santa Ana and Hermosillo the road runs close to the Sonora railway (see Appendix III, Section i). Beyond Hermosillo the road is considerably to the W. of the railway. Distances from Yuma : Quitovaquita (120 m.), last locality in the United States. The road which has been following the boundary line for some distance now enters Mexican territory at Cerro Prieto (122 m.). At Sonoyta (133 m.) road forks ; both branches meet again at Quitovac, village (160 m.). Garendullo (198 m.), road forks ; present route follows r. branch. El Coyote (206 m.). Juarez (215 m.). A road continues to San Francisco, on Rio Altar or Rio San Ignacio, about 18 m. to SW. Present route turns SE. Caborca, village (245 m.). A road leads to San Francisco, 40 m. to W. Another road goes S., see alternative Route (B). Present route continues SE. Pitiquito, village (250 m.). Road forks ; both branches meet again at Altar, town (265 m.). Several important roads meet at Altar. A road goes SE. to Ocuca (294 m.) and thence E. to Santa Ana (317 m.). Present route leads ESE. direct to Santa Ana (310 m.). Beyond Santa Ana the route is uncertain ; for a short distance a good road runs to the r. of the railway, then apparently the railway embankment is followed to Poza, village (362 m.), whence a good road runs to the l. of the railway. Carbo, village (376 m.). A road leads to Arizpe, about 70 m. to NE. Another road goes to Ures, about 55 m. to SE. Present route continues to l. of railway. Zamora (408 m.). A road goes ENE. to Ures ; see Route 5. San Juanico (419 m.). Hermosillo, city (425 m.). Numerous roads meet here. La Poza (442 m.). Roads branch off to the railway stations of

Willard, 12 m. NE., and Torres, 17 m. SE. Palma (456 m.). A road goes W. to San Rafael near the coast. Main route continues to Cajon (470 m.). Nochebuena (488 m.). Caballo (498 m.). San Jose, village (505 m.). Guaymas, city (510 m.).¹

(B) *Via Bonancita*. This route provides an alternative between Caborca and Hermosillo. The road is more direct but passes through a more mountainous district. It is suitable for wheeled traffic. Route (A) is followed to Caborca (245 m.), where the present route turns S. At m. 258 road forks, both branches meeting again at Bamori (276 m.). From Bamori a road leads WSW. to Puerto Libertad, on the Gulf of California, about 55 m. distant. Bonancita, hacienda (290 m.). A road goes NE. to Santa Ana, about 62 m. distant. Immaculata (312 m.). Tren (333 m.). A road leads NE. to the railway station of Querobabi, 45 m. distant. Casas Viejas (338 m.). Road forks; both branches meet again at Pozo Nuevo (359 m.). Hermosillo, city (393 m.). Thence Route (A) is followed to Guaymas (478 m.).

ROUTE 3

GUAYMAS-ALAMOS, 167 miles

Direction ESE. Along the old high road connecting Mexico City with the State of Sonora. The road appears to run at some distance from the railway (see Appendix III, Section i) but beyond Cocorit its position is uncertain. Distance by rail 160 m. After leaving the city of Guaymas the road passes through Batamotal (5 m.), near the railway junction of Empalme. Cruz de Piedra, hacienda (13 m.). Road crosses to r. of railway. Guasimas (21 m.). Pitahaya (35 m.). Torin, village (57 m.). Chumampaco, near which Rio Yaqui is forded (60 m.). Bacun, village (68 m.). Road crosses to l. of railway. Cocorit, village (79 m.). A road goes E. to Baroyeca, 30 m. distant, where it joins Route 4. Yucuribamba (92 m.). Cocoraqui (105 m.). Cabora, hacienda

¹ According to an official estimate the distance from Hermosillo to Guaymas is only 76 m.

(110 m.). Aquihuiquichi (119 m.). Barebampo, near which Rio Mayo is forded (129 m.). Soquisiva (132 m.). Camoa, village (136 m.). Osobampo (149 m.). Lomas (155 m.). Carrizal (159 m.). Alamos, city (167 m.).

ROUTE 4

HERMOSILLO-ALAMOS

Direction SE. Distance by railway 240 m. ; see Appendix III, Section i. Various routes can be followed.

(A) The old high road to Mexico City, i. e. Route 2 from Hermosillo to Guaymas (85 m.) ; thence Route 3. Total distance 252 miles.

(B) A cart road further to the E., as follows. Willard, railway station (12 m.). Zubiarte, mine (29 m.). Minas Prietas (38 m.). San Jose de Pimas, village (52 m.), where Route 6 (C) is intersected. Sanguijuela (68 m.), where Route 6 (B) is intersected. Between Sanguijuela and Cumuripa, village (126 m.) the route cannot be identified ; it is said to pass through Bonancita (94 m.). But from San Jose de Pimas a good road leads to Tecoripa, village (79 m.), see Route 6 (C), and thence down a tributary of Rio Yaqui, via Suaqui Grande, village (95 m.) to Cumuripa. By this road the distance would appear to be some 10 m. shorter. At Cumuripa the present route turns S. and follows the railway. Buenavista, village (157 m.). Route crosses Rio Yaqui. Baroyeca, village (198 m.). Between Buenavista and Baroyeca the route is uncertain and probably only a horse-track, but a good road crosses Rio Yaqui at Cumuripa, turns ESE. and then S. to Baroyeca, and appears to be considerably shorter than the track referred to above. From Baroyeca a road goes W. to Cocorit. Present route turns S. to Batacosa, village (209 m.). Route bends E. Quiriego, village (218 m.). Road bends SSE. down r. bank of Rio Mayo. Tepahui, village (227 m.), village on opposite bank. Conicarit or Concarit, village (240 m.). Road crosses Rio Mayo. Alamos, city (261 m.).

(C) By railway as far as Ortiz, comisaria (60½ m.); then almost due E. along a wagon road, built in 1910, via Moscobpo (82 m.), and Bonancita (98 m.), to Cumuripa, village (119 m.), where Route (B) is joined. Total distance, about 254 m.

ROUTE 5

HERMOSILLO-CASAS GRANDES (Chihuahua), about 378 miles ¹

Direction NE. The termini are connected by railway through Arizona, U.S.A. The road is fit for wheeled traffic except for a small section between Fronteras and the frontier, where the route appears to follow a mountain track. There is a regular diligence service between Hermosillo and Ures. Route 2 is followed to Zamora (17 m.), where present route turns into the valley of Rio Sonora, going up first the r. bank, then crossing frequently from one bank to the other. Topahue, hacienda on opposite bank (26 m.). San Jose de Gracia, village (29 m.). San Luis, hacienda (30 m.). Gavilan (34 m.). Santa Rosa (40 m.). San Rafael, hacienda (41 m.). Guadalupe, town (42 m.). Guaqui (46 m.). Ures, city (47 m.). San Pedro, hacienda (48 m.). El Prado (52 m.). San Joaquin, hacienda (53 m.). Puerta del Sol, congregacion (55 m.). A horse-track leads E. to Moctezuma, see Route 7 (B). Cañada Ancha (66 m.). Capilla (76 m.). A road leads E. to Moctezuma, see Route 7 (A). Baviacora, village (80 m.). San Jose (82 m.). San Pablo, comisaria (86 m.). Estancia (87 m.). Aconchi, village (90 m.). Tres Alamos (91 m.). Cañada (93 m.). Ranchito (95 m.). Huepac, village (98 m.). Ojo de Agua (100 m.). Mora, hacienda (103 m.). Banamichi, village (105 m.). Motepori, comisaria (110 m.). San Cristobal (117 m.). Sinoquipe, village (118 m.). Bavicanora, mine (121 m.). Tetuache (126 m.). Nogalitos (130 m.). Bamori, hacienda (134 m.). Arizpe, city (136 m.).

From Arizpe a horse-track goes W. to Magdalena (distance

¹ According to another itinerary the distance from Hermosillo to Arizpe by the route described is 185 m. If this be correct the total distance will be 427 m.

70 m.), and a carriage road (?) from Arizpe to Moctezuma (distance 78 m.).

The main road continues: Chinapa (157 m.). Bacoachi (168 m.). A carriage road goes SSE. to Moctezuma. Cuquiarachi, comisaria (191 m.). Fronteras (209 m.). Main road continues N. to Douglas, U.S.A., distant about 43 m. Present route turns E. along a mountain track. Batepito (247 m.). A carriage road goes SE. to Bacerac, village, and thence in a northerly direction over a mountain pass to Carretas, hacienda in Chihuahua. From Batepito present route continues E. to the frontier of Chihuahua, which is crossed near San Bernardino (264 m.). From here present route follows a carriage-road. After meeting the road from Bacerac and Carretas present route crosses Rio Carretas (about 290 m.). Palotada (319 m.). Janos, village (332 m.). A road goes to Ascencion, about 22 m. NE. At Janos, road forks; r. branch passes through Ramos, present route follows l. branch. Corralitos, hacienda (352 m.). A road goes N. to Ascencion, see Route 12. Present route turns SSE. Corralitos, railway station (360 m.). Road turns S. down the valley of Rio Casas Grandes. Colonia Dublan (371 m.). The road through Ramos, referred to above, rejoins main road. Casas Grandes, village (378 m.).

ROUTE 6

HERMOSILLO-SAHUARIPA or ZAHUARIPA

Direction E. Various roads can be followed.

(A) *Via Mazatan*. This is the most direct road and suitable for wheeled traffic throughout. On leaving Hermosillo route crosses Rio Sonora and continues E. At m. 31 a road branches off to Zubiata, 12 m. to S. At m. 40 a road branches off to Ures, 30 m. to N. Present route continues E. to Mazatan, village (52 m.). A road branches off to San Jose de Pimas, 28 m. to SSW. Present route crosses a river and follows up l. bank to Nacori Grande, village (56 m.). A road leads NNW. to Ures, another road NE. to Tepupa and Batuc. Present route bends SE. Soyopa, village (85 m.). Route

crosses Rio Yaqui, follows up a small tributary, and bends NE., passing to the E. of Cerro Pelon (107 m.). Bacanora, village (118 m.). Sahuaripa, village (134 m.), whence a carriage-road goes to Moctezuma, 78 m. NNW, and another to Nacori Chico, about 45 m. NNE.

(B) *Via Ortiz*. The Sonora railway (see Appendix III, Section i) is available as far as Ortiz, comisaria (60½ m. by rail). Thence a carriage-road is said to be available all the way, but between Sanguijuela and Soyopa its course is not marked on recent maps. The chief localities are : La Misa, hacienda (75 m.). Punta de Agua (80 m.). San Marcial, village (91 m.). Sanguijuela (99 m.), where Route 4 (B) is intersected. Johnson ? (101 m.). Aguacaliente, comisaria (114 m.). Tecoripa, village (117 m.), whence a wagon road goes to San Javier, La Barranca, and Toledo, three important mining centres. Mortero (119 m.). San Juanico (123 m.). Güisa (129 m.). Lajas (132 m.). Cerro Colorado (141 m.). Soyopa, village (153 m.), whence Route (A) is followed to Sahuaripa (202 m.).

(C) *Via Torres*. By the Sonora railway to Torres, comisaria (26 m.), whence a carriage-road goes E. rejoining Route (B) at Tecoripa. The chief localities are : Chivato (37 m.). Minas Prietas, village (39 m.), whence a wagon road goes to the graphite mines of Lapiz, 20 m. S. Aigame (50 m.), San Jose de Pimas, village (55 m.). Route 4 (B) is intersected. Bacitos (65 m.). Pedregosa (68 m.). Tucurubay (71 m.). Tecoripa, village (79 m.), thence by Route (B) to Sahuaripa (164 m.).

ROUTE 7

HERMOSILLO-MOCTEZUMA

Direction NE. No railway communication. Alternative roads are available.

(A) *Via Capilla*. The road is suitable for wheeled traffic throughout. Route 5 is followed to Capilla (76 m.), whence present route branches off to E. At m. 91 a road leads SE. to Sahuaripa. Present route bends ENE. Moctezuma,

village (111 m.), whence a carriage road goes SSE. to Sahuaripa, distance 78 m.

(B) *Via Puerta del Sol*. After leaving Route 5 at Puerta del Sol (55 m.) a horse-track is followed. The chief localities are: Mazocahui (73m.), Pastoria (89 m.), Lajas (94 m.), Arroyo Seco (96 m.), Bacachi (104 m.), Moctezuma (115 m.).

ROUTE 8

TOPOLOBAMPO—VILLADAMA (Nuevo Leon), about 737 m.

Direction E. This route crosses the greater part of northern Mexico from W. to E. The railway is available between Topolobampo, on the Gulf of California, and Fuerte, see Appendix III, Section iv. The quality of the road varies considerably. For the first 48 m. it is an ill-defined trail. Then for a short distance the high road from Mexico to Sonora is followed. Beyond Fuerte there is a carriage-road, apparently in poor condition, on which a diligence service was maintained in 1909 as far as Choix. Beyond Choix there is only a mountain track to Huasarachic, whence a carriage is available across the State of Chihuahua. Across the State of Coahuila the road is of inferior quality but suitable to some extent for wheeled traffic.

Distances from Topolobampo: Asinagua (4 m.). Bateve (10 m.). Zapotillo (20 m.). Mochicahui, village (25 m.). Butajaqui (39 m.). Sibirioja, ? village (48 m.). Then along Route 9 to Fuerte, town (69 m.¹). Near the station of Fuerte present route turns NE. Choix, town (113 m.). Route along a mountain track bends N. and crosses a tributary of Rio del Fuerte Ranchito (118 m.). Route bends NE. Nacimiento (125 m.). Track descends into the valley of Rio del Fuerte or Rio Miguel, and follows up the l. bank. Route enters State of Chihuahua (140 m.). Tubares (153 m.). Route crosses Rio Miguel (160 m.) and follows up the valley of Rio Batopilas,

¹ According to another estimate the distance from Topolobampo to Fuerte is 76 m., by railway it is 62 m.

a tributary of Rio Miguel. San Ignacio, a village near the confluence, but on the opposite bank. Batopilas, village and mine (183 m.). Route crosses Rio Batopilas and turns E. Yoquivo (192 m.). Route bends ESE., and passes to the S. of Cerro Grande (225 m.). Huasarachic (261 m.), whence route again follows a carriage-road. Bajoreachic (272 m.). Balleza, village (285 m.). A carriage-road leads to the city of Chihuahua, about 140 m. to N. Present route continues E. San Geronimo (310 m.). At m. 314 road crosses the Parral and Durango railway (see Appendix III, Section vi), and follows it for about 10 m. Boquillo, station (320 m.). Zenzontle (328 m.). Road crosses the Rosario branch line (see Appendix III, Section vi) and follows the line to Parral, city (333 m.). Road bends ESE. away from the railway. Allende, village (358 m.). Road crosses Rio Florido (375 m.) and follows NE. down the r. bank. A road continues E. to the railway station of Corralitos, about 35 m. distant. About 3 m. S. of the city of Jimenez (399 m.) present route turns ESE., crosses the railway from Jimenez to Torreon (408 m.), then bends ENE. through mountainous district. Beyond the mountain range road crosses the wide Bolson de Mapimi. Buenavista, hacienda (451 m.). Road deteriorates and enters State of Coahuila (475 m.). Road winds considerably and at m. 492 meets the branch line from Escalon to Sierra Mojada (see Appendix III, Section vi). Road follows the railway for about 12 m. Rincon (501 m.), a railway station. Providencia (510 m.). Road bends NE., then E., passing through a sparsely populated region. Puerto de la Vibora (552 m.). Zacatosa (556 m.). A road goes S. to San Pedro. Corral de Barrancas (567 m.). Rosario Junco (573 m.). Cuatro Cienegas, town (605 m.). A cart road goes to the mines of La Reforma and to Mineral de la Mula. Present route follows the branch line from Monclova (see Appendix III, Section viii). Sacramento, town (627 m.). Gonzalez (635 m.). Nadadores, town (640 m.). Monclova, city (653 m.). Road intersects Route 100 and continues ESE. El Oro, hacienda (665 m.). La Mota, hacienda (672 m.). San Pedro, hacienda (699 m.).

Road bends SSE. and enters State of Nuevo Leon (712 m.). Villadama, town (737 m.).

ROUTE 9

MAZATLAN-ALAMOS (Sonora), 381 miles

This is a section of the old high road from Mexico City to Sonora. It was repaired in 1903. The road crosses the State of Sinaloa from SE. to NW., running almost parallel to the coast, and at a short distance from the Southern Pacific railway (Appendix III, Section i), distance by rail 396 m. Distances : Palos Prietos (1 m.). Venadillo (5 m.). In this neighbourhood the diligence from Mazatlan leaves main road and turns NE. via Pueblo Nuevo, Chivillo, Puerta de las Canoas, Capule to Noria (distance from Mazatlan about 35 m.). Habal (10 m.). Potrero (14 m.). Camacho (23 m.). Quemado (28 m.). Quelite, village (30 m.). Limon, village (45 m.). Coyotitan, village (51 m.). Laviaga, ? hacienda (57 m.). Piaxtla, hacienda (60 m.). Elota, village (68 m.). Agua Nueva (80 m.). Guasimas (81 m.). Tepehuaje or Tepeguaje (83 m.). Vinapa, ? village (96 m.). Abuya, village (101 m.). Higuera de Abuya (105 m.). Tacuichamona, village (113 m.). Quila, village (120 m.). Salado (126 m.). Milpas (129 m.). Pueblo Viejo (131 m.). Carrizal (135 m.). Culiacan, city (153 m.). Juntas (154 m.). Macurimi (156 m.). Bellavista (157 m.). Rosa (158 m.). Higuerita (159 m.). Culiacancito, village (161 m.). Tamarindo (164 m.). Cacaragua (167 m.). Paredon (171 m.). Cabezas (177 m.). Lagunita (180 m.). Pericos, hacienda (186 m.). Rancho Viejo (189 m.). Bacamari (199 m.). Batomotita (206 m.). Palmas de los Leivas (211 m.). Mocorito, town (219 m.). A carriage road goes to Guamuchil, 13 m. distant, on the railway. Cienega (232 m.). Coyotes (239 m.). Negro (242 m.). Cerrillos (249 m.). Sinaloa, city (252 m.). In 1909 there was a diligence service between Sinaloa and the railway station of Bamoa, 9 m. distant. Cabrerias or Cabras (258 m.). Ocoroni, village (268 m.). El Padre (272 m.). Alamo (277 m.). Mescales

(285 m.). San Blas (298 m.). Sivajahui (304 m.). Sibirioja, ? village (305 m.). A track from Topolobampo comes in from S.; see Route 8. Tecolua (308 m.). Tehueco, village (313 m.). Bajada del Monte (318 m.). Bibajaqui (321 m.). Altillo (324 m.). Baroten or Baroteu (325 m.). Fuerte, town (326 m.). Galera (328 m.). Arroyo del Mesquite (341 m.). Cosonate (348 m.). Frontier of Sonora is crossed. Arroyo de Papizuela (352 m.). Basirva (356 m.). Arroyo de San Vicente, ? hacienda (360 m.). Arroyo de Jerecoa (364 m.). Arroyo de Isleta (366 m.). Mercedes, hacienda (377 m.). Alamos, city (381 m.). For continuation of road in Sonora see Route 3.

ROUTE 10

CULIACAN (Sinaloa)—DURANGO, 335 miles¹

Direction E. No railway communication up to m. 170. Beyond Tepehuanes the road runs within a short distance of a railway (Appendix III, Section viii). A carriage-road is followed as far as Cofradia; beyond that point only horse-tracks are available. Distances from the city of Culiacan: Barrio ($2\frac{1}{2}$ m.). Moras (5 m.). Carrizalejo (13 m.). Imala (24 m.). Cofradia (26 m.). Route follows a mountain track. Cruz de la Palma (31 m.). Milpas (37 m.). Guzmancillo (44 m.). Route enters State of Durango. Jala (47 m.). Tamazula, village (55 m.). Totahue (60 m.). Frijolar (65 m.). Bajada (71 m.). Coluta (76 m.). Angostura (86 m.). Agua Blanca (97 m.). Canelas, village (108 m.).² Mampueros (131 m.). Huascojil ? (154 m.). Tepehuanes, village (170 m.). A carriage road goes N. to Rosario, see Route 18. Present route turns SE. and follows close to the railway. Presidios, congregacion (176 m.). Vado de las Sandias (180 m.). Corrales (186 m.). Herreras (191 m.). Santiago Papasquiaro,

¹ According to another account the total distance is only 294 m., and the intervening distances correspondingly shorter.

² A recent map marks a track from Canelas (108 m.) through Papadas (118 m.), Bascojil (138 m.), Palomas (152 m.), Urbaleja (158 m.), Lobos (165 m.), and ending at Tepehuanes (190 m.).

city (201 m.). Chinacates, hacienda (230 m.). Purisima (233 m.). A carriage road goes E. to Coneto, where it links up with Route 22 (A). Present route continues SE. Magdalena, hacienda (245 m.). Guatimape, hacienda (258 m.). Canatlan, village (about 290 m.). A road goes NNE. to San Juan del Rio; see Route 23 (A). San Jose de Gracia, village (295 m.). Cacaria, hacienda (300 m.). San Antonio (309 m.). Chupaderos (319 m.). San Juan de Dios (327 m.). Durango, city (335 m.).¹

ROUTE 11

MAZATLAN-DURANGO, 158 miles

Direction ENE. A railway is projected, but only a short section is completed, see Appendix III, Section viii. Two roads are available.

(A) *Via Concordia*. In the State of Sinaloa the road is used for wheeled traffic, especially by diligences running between Mazatlan, Concordia, and Panuco, but according to information of 1909 it is very rough and dusty. The route passes to the E. of Panuco, and from the point where it leaves the Panuco road it becomes a horse track, undulating, but chiefly rising by steep grades to the top of the plateau. In the Sierra there are a few wooden bridges, but they are roughly built and in a tottering condition. A few miles before reaching Durango the road widens, and is used by two-wheeled carts drawn by mules, usually 6 to 8 mules to each cart. In the Sierra the country is much broken and rocky, but generally well wooded (pine- and fir-trees). From Mazatlan the land journey can be slightly reduced by taking the steam-launch which crosses the estuary to El Confite and rejoining main road from that point.

Distances: Urias (4 m.). Castillo (7 m.). Venadillo (13 m.). Chino (14 m.). Rio del Presidio crossed before entering Villa Union, town (16 m.). Embocada (22 m.). Cuesta Malpica (26 m.). Concordia, town (29 m.). A road

¹ According to another account the total distance is only 294 m., and the intervening distances correspondingly shorter.

branches off to Guasima (37 m.). Main route continues to Camino del Rey (41 m.). Platanitos (42 m.). Copala, village and mine (45 m.). Cumbre Bocosco (48 m.). Peña Hueca (49 m.). Charcas (53 m.). A road branches off to Panuco just before Taste (54 m.). Santa Lucia, village (56 m.). Durazno (57 m.). Vatel (59 m.). Arroyo Laureles (61 m.). Rio Ocotes (65 m.). Rio Palmitos (66 m.). Ventana (67 m.). Rio del Beluarte (68 m.). Road crosses frontier of Durango State. Chapote (70 m.). Ramada (71 m.). Escondida (75 m.). Botijas (79 m.). Cienega (81 m.). Chavarria, congregacion (84 m.). Tecomate (88 m.). Junta de los Caminos (94 m.). Florida (95 m.). Piloncillos (97 m.). Salto (105 m.). Coyotes (109 m.). Cruz de Piedra (115 m.). Llano Grande, congregacion (118 m.). Navajas (122 m.). Navios (128 m.). Charcos (130 m.). Buenavista (134 m.). Mimbres (135 m.). Cerritos (140 m.). Palma (142 m.). Rio Chico (145 m.). Pino (149 m.). Calzon Rotto (150 m.). Las Indias (152 m.). Escalon (153 m.). A road branches off to Jaral (154 m.). Main route continues to Arroyo (155 m.). Salto (156 m.). Durango, city (158 m.).

(B) *Via Puerta de las Canoas*. Distances not stated. This route appears to run a little to the W. of that described above, joining it at Rio Chico (145 m.). For a short distance it follows the old highway to Sonora (Route 9). Beyond Venadillo (5 m.) it turns NE. along the wide carriage road leading to Noria, leaving it again at Puerta de Canoas, a large village. Then along a very dusty road through maize fields, gradually rising to the wooded plateau of Puerta de San Marcos, village. Population relatively dense. Road, now very narrow and dusty, follows the Rio Uraca, then crosses the river (3 ft. deep), passes over a high ridge, and recrosses the river. A path follows the river round the ridge. Road leads up steep slope, covered with trees and bushes. Las Lamas, ? small village on plateau, some maize fields. Road passes over mountain ridge and through another valley, a fair-sized stream must be forded. Beyond the next ridge Pueblito, a small village on a wide stream, is reached. Steep, winding

road across the mountain pass of Espinasso del Diablo. Descent through the Tepalcates valley; the track crosses the river about 10 times. Las Canitas, ? small village. Tepalcates, village. From here the road winds up the plateau to Piedra Gorda. Undulating and winding road to Rancho Sauz, followed by steep ascent to Ciudad Rancho ?. From this point the track follows the telegraph-line from Panuco to Durango. Chuntas, ? small village. Road more sandy or stony, less shade. Steep descent to Rio Chico, a wooded valley. Road rejoins Route (A), and beyond the next ridge continues to descend nearly all the way to Durango.

ROUTE 12

CIUDAD JUAREZ-CASAS GRANDES (Chihuahua)

Direction SW. The termini are connected by a railway (see Appendix III, Section v); distance by rail 150 m. Alternative routes are available.

(A) *Via Los Medanos.* Along a carriage road. After leaving Ciudad Juarez route goes S. along the railway to Chihuahua (see Appendix III, Section vi). Tierra Blanca (19 m.). Samalayuca, hacienda (30 m.). Railway station to W. Los Medanos (42 m.). A road continues S. along the railway; see Route 14. Present route turns SW. Salinas de la Union (63 m.). Three roads branch off to S. and SE., ultimately leading to the railway. Vado de Santa Maria (98 m.). Road crosses Rio Santa Maria. At m. 111 a road leads NW. to Sabinal, linking up with Route (B). Present route goes SW. and joins the railway to Casas Grandes. San Pedro, village (126 m.). Road crosses to r. of railway. Corralitos Station (144 m.). whence Route 5 is followed to Casas Grandes (162 m.).

(B) *Via Sabinal.* By rail as far as Sabinal Station (97 m.). Thence along a carriage-road leading to Colonia Diaz, on which there is a regular diligence service. Mineral del Sabinal (110 m.). Road bends WNW. Ascencion, village (133 m.). Main road turns N. to Colonia Diaz, 4 m. distant. Another goes SW. to Janos. Present route turns S. along a carriage-

road which during the military operations in 1910-11 was utilized by cavalry and artillery. Corralitos, hacienda (160 m.), whence Route 5 is followed to Casas Grandes (186 m.).

ROUTE 13

CASAS GRANDES-CHIHUAHUA, 208 miles

Direction SSE. This is a continuation of Route 5 and Route 12. For railway connexion see Appendix III, Sections v and iv; distance by rail 322 m. A carriage road is available throughout. During the military operations of 1910-11 artillery was conveyed by it. The railway station of Nuevas Casas Grandes is about 4 m. to NE. There is a diligence service between the station and Colonia Juarez, about 10 m. SW. of Casas Grandes. The present route is as follows. Road crosses Rio Santa Maria (23 m.) and forks; a road leads ENE. to Villa Ahumada. Present route turns S. Galeana, village (32 m.). Road forks; r. branch is longer and passes through San Buenaventura, village, and through a cañon. Present route follows l. branch. Ojo de la Sanguijuela (52 m.). Carmen, hacienda (70 m.). The branches referred to above meet again. Noria. Road forks again; r. branch is considerably shorter, but l. branch is a better road. Present route follows l. branch. Gallego (113 m.), a station on the Juarez-Chihuahua line. Road crosses railway and turns S. Mocho (126 m.). A road goes E. to Agua Nueva. Present route continues S. along the railway, first to the l., then crossing to the r. of the line. Laguna de Encinillas (140 m.). The r. branch referred to above rejoins main road. Sauz, hacienda (172 m.). Terrazas (180 m.). Chihuahua, city (208 m.).

ROUTE 14

CIUDAD JUAREZ-CHIHUAHUA, 240 miles

Direction S. The cities are connected by railway (see Appendix III, Section vi), distance by rail 225 m. A carriage-road runs in proximity of the railway, crossing the line at

frequent intervals. From Ciudad Juarez Route 12 (A) is followed to the railway station of Los Medanos (42 m.). Thence present route continues S. along the railway. Rancheria (62 m.). A road goes NE. to the Rio Grande. Lucero (70 m.). A road goes NE. joining the road from Rancheria. Another road goes NW. to Salinas de la Union, connecting with Route 12 (A). Present route continues S. San Jose, hacienda (78 m.). Villa Ahumada (85 m.). A road goes ENE. to the Rio Grande. Another road leads SW. through Carrizal, Barrancas, and San Isidro to Carmen (about 50 m. from Villa Ahumada), where it links up with Route 13. Present route continues S. Ojo de Magdalena (90 m.). Carrizal station (93 m.). Carrizal village is about 8 m. to W. Ojo Caliente (100 m.). Roads branch off in various directions. Las Minas (111 m.). A road leads WSW. to Carmen, meeting the road from Villa Ahumada at San Isidro. Present route continues S. along the railway. Jesu Maria (114 m.). The railway station of Moctezuma is about 3 m. to SSE. Chivatito (127 m.). Alsacia (133 m.). Gallego (145 m.). Thence by Route 13 to Chihuahua, city (240 m.).

ROUTE 15

ALAMOS (Sonora)-CHIHUAHUA, 348 miles

Direction NE. Railway connexion only exists through Arizona, U.S.A. The track is uncertain between Chinipas and Ocampo. From Alamos a carriage-road goes via Higuera (5 m.), Tabela (11 m.), and Tanques (18 m.) to Camotes (23 m.). Then a horse-track is followed through Taymuco (31 m.) and Chinacas (50 m.), where the track crosses the frontier of the Chihuahua State, to Chinipas or Chinepas, village (71 m.). Chinipas is about 75 m. from Sanchez, the present terminus of the line from Chihuahua (340 m.); see Appendix III, Section iv. Chinipas is connected with the mining centre of Ocampo or Jesu Maria (about 140 m.) by a track of which no details are available. From Ocampo there is a good wagon-road. Pinos Altos, village (148 m.). Concheño.

village (153 m.). Cocomorachic or Cocomachic (198 m.). Matachic, village (207 m.). Matachic is connected with Chihuahua by 140 m. of railway (see Appendix III, Sections iv and v). Road crosses the railway and turns SE., running within a short distance of the railway. Tecalocachic (213 m.). At m. 221 a road branches off to Galena, about 130 m. to N. Another road leads W. to the railway. Present route continues SE. Santo Tomas (227 m.). Girasol (232 m.). The city of Guerrero is about 7 m. to SW. Pedernales, hacienda (259 m.), where a track turns the Malpaso, avoiding the narrow defile through which the line passes, and rejoins the railway at the station of San Antonio. Artillery was taken over this track during the military operations of 1910-11. The carriage-road also appears to pass through the barranca. Casa Colorada (267 m.). Present route turns away from the railway in an ESE. direction, crossing a branch line from San Antonio to Cusihiuriachic some 7 m. beyond. Carretas (305 m.). A road goes SE. to Bavanolava, where it joins the road from Chihuahua to Balleza (cf. Route 8). At Carretas present route turns NNE. Santa Isabel, village (320 m.). Route crosses the railway. Fresno, village (339 m.). Road crosses to r. of railway. Chihuahua, city (348 m.).

ROUTE 16

OJINAGA-CHIHUAHUA

Direction SW. For railway communication see Appendix III, Section iv; the railway is not complete. Two routes are available.

(A) *Via Coyame.* Along a carriage-road. Distances from Ojinaga, a town on the Rio Grande, near the border of Texas: San Juan, a village on l. bank of Rio Conchos (18 m.), Alamo (30 m.). Road turns away from Rio Conchos and goes NW. up a tributary. Fortin (36 m.). Road bends SW. Coyame, village (54 m.). A road goes E. to Cuchillo Parado. Another road goes S. to Pueblito. Present route continues WSW. Hormigas (92 m.). A road leads to the station of Encantada,

about 9 m. to E. Present route continues SW. Peña Blanca (112 m.). Road bends S. and crosses the railway. Aldama, village (124 m.). Road crosses to r. of railway and runs close to the line. Tabaloapa, hacienda (141 m.). Chihuahua, city (144 m.).

(B) *Via Cuchillo Parado*. Along a track which cannot be identified with certainty. In some sections, especially beyond Cuchillo Parado, it is liable to be very muddy and almost impassable after rain. During the military operations of 1910-11 it was utilized by artillery. On leaving Ojinaga the track leads S. through a hilly district via Rancho del Chopo and the village of Mula (about 30 m. ?). Route bends W., then NW. ?. Cuchillo Parado, village (about 70 m.). A road leads to Coyame, 19 m. to W. Present route apparently goes SW. ? via Crezon de las Animas, Pachequeno or Pacheco ?, El Rodriqueño (distant about 12 m. from Coyame), and ultimately reaches the railway station of Sostenes (about 100 m.). Thence present route follows the railway to Aldama (152 m.), where it joins Route (A) and continues along it to Chihuahua (172 m.).

ROUTE 17

CHIHUAHUA-DURANGO

Direction S. Two carriage-roads are available.

(A) *Via Yerbanis*. As far as Jimenez the road runs in the proximity of the railway (Appendix III, Section vi), and at Pedriceña it links up with the line from Torreon to Durango (Appendix III, Section viii). Distance by rail 450 m. By road distances are: Bachimba, hacienda (33 m.). Meoqui San Pablo, village (49 m.). Road forks; both branches meet again at m. 62. Saucillo, village (70 m.). La Cruz, village (85 m.). Santa Rosalia, large village or town (96 m.). A road goes SW. to Parral; another road goes NNE. to Ojinaga. Present goes SE. Enramada, hacienda (116 m.). Reforma (122 m.). A road branches off to SE.; see Route 25 (C). San Agustin de Saucillo (129 m.). A road goes WSW to Parral. Present route turns S. Jimenez, town (148 m.).

About 3 m. S. of Jimenez present route joins Route 8 and follows it to Allende, village (189 m.). Present route turns off SE. Rio Florido, hacienda (208 m.). Road bends S. San Isidro (214 m.). Road enters State of Durango. La Parida (228 m.). To the E. the Arroyo de la Parida forms the boundary between the States of Chihuahua and Durango. Cerro Gordo or Villa Hidalgo (244 m.). A road goes SE. to Mapimi; see Route 25 (A). Present route goes S. Guitarrilla (260 m.). Cruces, hacienda (269 m.). Zarca or Zerco ?, hacienda (277 m.). A road branches off to r. and leads to San Juan del Rio; see Route (B). Present route goes SE. Peñoles, mining centre (307 m.). A road goes ENE. to Mapimi; see Route 21 (A). Another road goes NNW. to Atotonilco and Cerro Gordo. Present route goes SE. San Pedro del Gallo, town (314 m.). A road goes NNE., then ENE. to Mapimi; see Route 21 (B). Present route continues SSE. Noria (326 m.). Maguey (331 m.). Road forks. Present route follows r. branch. San Luis de Cordero, town (339 m.). Three miles farther S. road meets Rio Nevas and turns E. along l. bank. Agua Nueva (346 m.). Road crosses the river and bends S. to Nazas, city (354 m.). A road leads SW. to San Juan del Rio; see Route 23 (A). Present route goes NE., following a good carriage-road to the railway station of Pedriceña (378 m.). Diligences connect Nazas with the station of Pedriceña in 8 hrs. Beyond Pedriceña present route runs within a short distance of the railway. Pasaje, hacienda (392 m.). Yerbani (412 m.). A road goes NE. to Saltillo; see Route 20. Present route crosses to r. of railway. Gabriel, hacienda (454 m.). Alternative Route (B) via San Juan del Rio rejoins present route. Road crosses to l. of railway and continues SW. Chorro (471 m.). A road goes S. to Zacatecas, joining Route 19. Present route continues SW. to Durango, city (494 m.).¹

(B) *Via San Juan del Rio.* Route (A) is followed to

¹ A more direct track appears to exist between Jimenez and Cerro Gordo, and according to other estimates the total distance has been given as 429 m. or even 402 m.

Zarca (277 m.), where present route branches off in a southerly direction. Casco, hacienda (304 m.). Tinaja (312 m.). Near Agua Zarca (340 m.) road crosses Rio Nevas. Palmito (351 m.). A track goes N. to El Oro; see Route 22 (A). Present route continues S. Menores (360 m.). A road goes NE. to Nazas; see Route 23 (A). Present route continues S. San Juan del Rio, city (366 m.). From here Route 23 (A) can be followed via Canatlan. Present route continues S. Ojos Azules (384 m.). Avino, village (390 m.). Panuco, village (394 m.). Gabriel, hacienda (402 m.). A diligence service connects the city of San Juan del Rio with the railway station of Gabriel. From this point Route (A) is followed to Durango (442 m.).

ROUTE 18

ROSARIO-TEPEHUANES (Durango)

Direction S. Two carriage-roads connect Rosario on the Parral branch line (Appendix III, Section vi) with Tepehuanes, the present terminus of a line from Durango city (Appendix III, Section viii).

(A) *Via Coscomates*. Distances from Rosario station: Rueda, hacienda (3 m.). A road branches off SE.; see alternative Route (B). Present route goes S. Delicias Cohinera (12 m.). Road crosses a river. At m. 24 a wagon-road branches off to Carmen, about 15 m. to NW. Present route continues S. and crosses a river. Tule (29 m.). Road bends SW. and skirts the W. slope of the Sierra de la Candela. Coscomates (45 m.). A road branches off to the village of Guanacevi about 11 m. to W. Present route goes S. Zape Chico (52 m.). Zape, village (56 m.). Alternative Route (B) rejoins present route. Road crosses a river, recrosses it 3 m. farther up, then follows up the r. bank. Cienega (72 m.). Road winds considerably and crosses a watershed. Then follows l. bank of a river to Tepehuanes, village (95 m.).

(B) *Via El Oro*. Route (A) is followed to Rueda (3 m.) where present route continues down the r. bank of Rio Florido. Pueblito (6 m.). Canutillo, hacienda (19 m.). Before

reaching this place a road branches off in a northerly direction to San Isidro and links up with Route 17. Present route turns away from Rio Florido and enters a mountainous mining district. Sauces (30 m.). Road forks; present route follows r. branch and bends S. Encino (36 m.). El Oro, village (54 m.). A track branches off SE. to Inde; see Route 22 (A). Present route bends W., then SW.; crosses a river (60 m.) and passes over Sierra de la Candela, rejoining Route (A) at the village of Zape (87 m.). Thence Route (A) is followed to Tepehuanes (126 m.).

ROUTE 19

DURANGO-ZACATECAS, 188 miles

Direction ESE. Railway communication exists via Torreon (Appendix III, Sections viii and vi); a shorter line from Durango to Cañitas was recently opened. The road appears to be fit for wheeled traffic. According to a report dated 1893 the mails were conveyed on this road by coach from Durango to Chalchihuites. Diligences run between Sombrerete and Sain Alto and continue to Gutierrez, a station on the line from Torreon (Appendix III, Section vi). The diligence covers the distance from Sombrerete to Gutierrez (65 m.) in 12 hrs. Chief localities from Durango: Navacoyan, hacienda (8 m.). San Javier (19 m.). Arenal, congregacion (24 m.). Fabrica (31 m.). Nombre de Dios, city (37 m.). Juana Guerra, hacienda (40 m.). Graceros, congregacion (54 m.). Molino (55 m.). Chalchihuites, mine (70 m.). Road crosses the frontier of Zacatecas. Sauces (80 m.). Lo de Mena, hacienda (85 m.). A road goes NW. to Chorro where it links up with Route 17 (A). Sombrerete, city and mine (91 m.). Arenal (104 m.). Cantuna (111 m.). Sain Alto, town (117 m.). Sauz, hacienda (121 m.). Arroyo del Sauz (122 m.). Arroyo de Torrecillas (126 m.). Escondida (128 m.). Arroyo de Palos Amarillos (130 m.). Rancho Grande (135 m.). Chicharrona (144 m.). Fresnillo, city (148 m.). Puente de Echeverria (152 m.). Puertos Chilitos (153 m.). Arroyo de Estanzuela (154 m.). Alamo (158 m.). Arroyo de Jarrillas

(159 m.). Arroyo de Enmedio (169 m.). Calera, ? hacienda (171 m.). Pilas (177 m.). Puerto de Mala Noche (184 m.). Zacatecas, city (188 m.).

ROUTE 20

DURANGO-SALTILLO (Coahuila)

Direction NE. A railway connects the two cities (Appendix III, Sections viii and vii); distance by rail, 347 m. The nature of the road varies considerably. There appears to be a good carriage-road as far as Calvo. Thence a cart-road is followed to La Paz, beyond which point only a track is available. Route 17 (A) is followed to Yerbánis (82 m.). At this point Route 17 (A) turns N. to Nazas; present route continues NE. to Cuencame, town (99 m.). A road goes N. to Lerdo. Present route turns E. Lagunilla (120 m.). Road crosses Rio Aguanaval (124 m.), a river which forms the boundary between the States of Durango and Coahuila. Huarichi or Huarichic (132 m.). Road recrossed Rio Aguanaval and bends S. up the l. bank of the river. Martín (136 m.). Masamitote, hacienda (140 m.). San Bartolo, hacienda (148 m.). A short distance beyond road crosses a tributary of Rio Aguanaval and bends N. Rosalia (166 m.). Road recrosses Rio Aguanaval (169 m.) and enters a difficult mountainous district of the State of Coahuila. Road crosses Sierra de la Candelaria. Calvo (186 m.), a station on the line from Torreon to Zacatecas (Appendix III, Section vi). At m. 194 a cart road branches off W. to the station of Peralta. Present route goes NE. across the Sierra de Jimulco. Viesca, town (224 m.). Road runs close to the railway. Peña, hacienda (242 m.). Road bends N. away from the railway. Boquillas (248 m.). Rafael (258 m.). Road bends E. and follows to the r. of the railway from Torreon to Monterey (Appendix III, Section vii). San Carlos (282 m.). The railway station of Paila is about 2 m. to N. A cart-road connects the station with Parras, a town about 16 m. to the S. of San Carlos. Present route continues E. At m. 292 it

turns away from the railway and bends SE. Seguin, hacienda (312 m.). A track leads W. to Parras. Present route goes SE. and runs to the l. of the Torreon-Salttillo railway. Patos or General Zepeda, town (334 m.). La Paz, hacienda (341 m.). From here a track is followed which frequently crosses the railway line. San Jose (347 m.). Rancho Nuevo, hacienda (352 m.). San Juan de la Vaqueria, hacienda (363 m.). A track goes S. to Zacatecas; see Route 40. Present route continues E. Buenavista, hacienda (382 m.). A track goes S. to San Luis Potosi; see Route 102. Present route bends N. to Saltillo, city (390 m.).

From Patos (334 m.) an alternative route is provided by a track to Jaral (356 m.), and thence by Route 100 to Saltillo (401 m.). Diligences were plying on both roads in 1897.

In addition to the route described above a shorter track appears to be available between Cuencame and Patos. It is said to go as follows: Cuencame (99 m.). Rio Aguanaval (138 m.). Estancia de Pozo y Calvo (146 m.). Alamo de Parras (177 m.). Peña (195 m.). Parras, town (234 m.). Castañeda (255 m.). Patos (273 m.) ?.

ROUTE 21

MAPIMI-DURANGO

Direction SSW. Distance by railway via Torreon, 199 m., see Appendix III, Sections vi and viii. Two routes are available.

(A) *Via Zarca*. A carriage-road leaves the town of Mapimi in a westerly direction. After a few miles it enters a hilly district and deteriorates, but remains suitable for wheeled traffic. Santa Librada (15 m.). Trinidad, congregacion (21 m.). Asartuta (32 m.). Alternative Route (B) branches off to S. Present route continues W. along a carriage-road. Mina de Cobre (38 m.). Road bends SW. Peñoles (42 m.). Thence Route 17 (A) is followed to Zarca (72 m.), and Route 17 (B) from Zarca to Durango (237 m.).

According to an 'Itinerary' Mapimi is also connected with

Zarca by a track as follows : Cadena (48 m.), Cruces, hacienda (104 m.), Zarca (150 m.) ; but the distances would seem to have been considerably overestimated.

(B) *Via Nazas*. Route (A) is followed to Asartuta (32 m.), whence a carriage-road goes S. to San Pedro del Gallo, town (41 m.). From this point Route 17 (A) is followed to Durango (221 m.).

ROUTE 22

EL ORO-DURANGO

Direction S. There is no railway communication, but a branch line from Parral (Appendix III, Section vi) will ultimately be continued to El Oro. Two routes are available.

(A) *Via Ramos*. Up to the point of junction with Route 17 (B) only a mountain track is available. The track on leaving El Oro goes E. Inde, town (11 m.). A few miles beyond Inde track forks ; both branches meet again at m. 84. Present route follows r. branch and bends S. Tres Vados (30 m.). Alternative Route (B) appears to branch off to E. Present route continues S. and crosses Rio Nevas. Thence it passes over high ground and descends into the valley of Rio Pasquiario, a tributary of Rio Nevas. Before reaching Ramos, hacienda (53 m.), route crosses Rio Pasquiario. Track crosses the Sierra de San Francisco and bends E. into the valley of Rio Nevas, crossing the river at m. 81. Jicorito (84 m.). The branch referred to above rejoins main route, which from this point follows down the l. bank of Rio Nevas. Trinidad, hacienda (90 m.). San Salvador, hacienda (97 m.). San Antonio (100 m.). Route crosses Rio Nevas and follows down the r. bank. Rodeo, village (107 m.). Coneto, village (110 m.). A carriage-road goes W. to Purisima, where it links up with Route 10 and with the railway (Appendix III, Section viii). The distance from Coneto to the station of Purisima is about 48 m. Beyond Coneto present route continues S. up the valley of a tributary of Rio Nevas. Palmito (116 m.). Thence a carriage-road (Route 17 B) is available to Durango, city (207 m.).

(B) *Via Casco*. Route (A) is followed to Tres Vados (30 m.), thence a track, which cannot be identified on the map, is said to go in an easterly direction across a mountain range to Casco, hacienda (63 m.), whence Route 17 (B) is followed to Durango (201 m.).

ROUTE 23

DURANGO—NAZAS

Direction NE. Various routes are available.

(A) *Via Canatlan*. N. along Route 10 as far as Canatlan, village (about 45 m.), whence a carriage-road going NNE. is followed. Santa Isabel, hacienda (61 m.). Lagoon to E. of road. San Lucas ? (72 m.). Road bends E. Cienega (76 m.). San Pedro (80 m.). San Juan del Rio, city (84 m.). Present route meets Route 17 (B) and follows the latter in a northerly direction to Menores (90 m.), whence present route branches off NE. along a carriage-road to Nazas, city (126 m.).¹

(B) *Via Gabriel*. NE. along Route 17 (A) to Gabriel (40 m.), thence N. along Route 17 (B) to San Juan del Rio (76 m.). Beyond San Juan del Rio Route (A) is followed to Nazas (118 m.).

(C) *Via Pedriceña*. Along Route 17 (A). Distance 140 m.

ROUTE 24

DURANGO—MEZQUITAL, 29 miles

Direction S. No railway communication. Nature of road not stated. It passes through Estancia del Capulin (16 m.) and Bocas (24 m.). Total distance, 29 m.²

There appears to be another, somewhat longer, road along Route 19 to Nombre de Dios (37 m.), then W. to Mezquital (57 m.).

¹ According to an 'Itinerary' the distance from Durango to San Juan del Rio is given as 77 m., and the total distance as 111 m.

² The distance by this route appears to have been underestimated, it is probably just over 40 m.

ROUTE 25

CHIHUAHUA-TORREON

Direction SE. The cities are connected by railway (Appendix III, Section vi) ; distance by rail, 293 m. Various routes are available, all along carriage-roads.

(A) *Via Cerro Gordo.* From Chihuahua Route 17 (A) is followed to Cerro Gordo or Villa Hidalgo (244 m.), whence present route branches off SE. Atotonilco, hacienda (267 m.). A road continues SE. to Peñoles, where it links up with Routes 17 (A) and 21 (A). Present route bends NE. Boquilla (282 m.). Route crosses a river and bends SE. At m. 293 Alternative Route (B) comes in from N. Present route continues SE. San Jose de Playa (300 m.). A road goes S. to San Pedro del Gallo on Route 17 (A). Present route continues SE. and crosses a branch line from Conejos (308 m.). At m. 325 road forks. Present route follows l. branch. Mapimi, town (330 m.). A branch line connects the town with the main line to Torreon. At Mapimi road forks, both branches being about the same length, and meeting again at Lerdo, city (367 m.). From Lerdo two roads lead to Torreon (374 m.), one followed by an electric line, the other of about the same length via Gomez Palacio, is shaded up to that city. In 1901 a mule tram was running on this road, but in 1907 electric traction was substituted from the station of Gomez Palacio to Lerdo.

(B) *Via Corralitos.* Route 17 (A) is followed up to m. 151, just S. of Jimenez, whence Route 8 is followed in an easterly direction up to the point where it meets the railway from Jimenez to Torreon (160 m.). Present route branches off SE., and runs to the r. of railway. Dolores (163 m.). Corralitos (178 m.). A road goes E. to Canas, about 9 m. distant, and links up with Route (C). Present route bends S. away from the railway. San Ignacio (203 m.). A road goes W. to Rio Florido, about 40 m. distant, where it links up with Route 17 (A). Present route continues S. San Bernardo (212 m.). A road goes SW. to Cerro Gordo, 30 m. distant.

Another road goes E. and links up with Route (C). Present route continues S. and crosses a river (218 m.), then bends SE. and enters the state of Durango (228 m.). Road follows l. bank of a river. Carmen (233 m.). At m. 241 the road joins Route (A) and follows it to Torreon (322 m.).

(C) *Via Escalon*. Route 17 (A) is followed up to Reforma (122 m.), where present route branches off to SE. and crosses Rio Florido. Chupaderos (142 m.). Road intersects Route 8 (151 m.). Canas (164 m.). A road goes W. to Corralitos and links up with Route (B). Present route continues SE. and crosses a river (176 m.). Escalon, village and railway junction (185 m.). Road crosses the Jimenez-Torreon line (192 m.). Route crosses a river (207 m.). Roads branch off in various directions, one going E. to the railway station of Ceballos, about 8 m. distant. Present route continues SSE. and enters State of Durango (210 m.). A road goes W. to San Jose de Playa (231 m.). Present route continues SE. and crosses a branch line from Conejos (234 m.). Santa Maria (245 m.). Route crosses another branch line from Conejos. Mapimi, town (260 m.). Thence by Route (A) to Torreon (304 m.).

ROUTE 26

MAZATLAN (Sinaloa)—**TEPIC** (Nayarit), about 225 miles

Direction SE. A railway connects the towns (Appendix III, Section i); distance by rail, 197 m. The route lies along the old highway from Sonora to Mexico, and was formerly used by diligences. In 1909 it was described as rough and very dusty. In 1914 diligences used to take 13 hrs. from Acaponeta to Santiago. Distances from Mazatlan : Palos Prietos (1 m.). Urias (5 m.). Villa Union, town (17 m.). Santa Fe (25 m.). Aguacaliente, village (27 m.). Potrerillos, village (42 m.). Rosario, city (50 m.). Lazaro (55 m.). Escuinapa, town (63 m.). Piedra Agachada (80 m.). Caligüey (82 m.). Piedra Gorda (83 m.). Concepcion, village (103 m.). The Rio de las Cañas marks the boundary between Sinaloa and Nayarit (formerly territory of Tepic). Bayona, hacienda (104 m.).

Acaponeta, town (122 m.). Sayamota, Rosamorada, village, San Pedro, village, Santiago Ixcuintla, city (about 182 m.). The river is forded at low water ; in the rainy season it is navigated by boats drawing up to 9 ft. Navarrete (about 212 m.). A road from San Blas joins in on the r. ; see Route 27. Tepic, city (about 225 m.).

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ROUTE 27

SAN BLAS—GUADALAJARA, about 150 miles

Direction SE. No railway communication. Diligences run between San Blas and Tepic, between Etzatlan and Magdalena, and between Tequila and Orendain. The diligence from Tepic to Ixtlan appears also to follow this route most of the way. On leaving San Blas the road is alternately stony and sandy. It goes E. through fields partly covered with bushes. A small estuary is crossed by ferry ; on opposite bank road rises through dense tropical vegetation. A village (Zapotillo ?) in middle of the wood. Road, now very dusty, leads down to and across a plateau. A small stream crossed before entering Navarrette (4½ hrs.' ride, about 17 m.). At Navarrette the old high road to Mexico is rejoined ; see Route 26. It winds and rises considerably. Tropical vegetation gives way to maize-fields and plantations of sugar cane. Road undulating, then again level and sandy up to Tepic, city (10½ hrs.' ride, about 30 m.). Beyond Tepic the road is broad, level, and sandy. Rivers are crossed by substantial stone bridges. Pools flank the road from time to time. There is much traffic, chiefly mule caravans and two-wheeled carts drawn by oxen. Road crosses a bare plain studded with rocky hillocks and cut by a few small streams.

Leones, ? hacienda (16 hrs.' ride, about 41 m.). Road partly paved with cobbles and in bad condition. After 20 hrs.' ride (about 49 m.) road enters district covered with pine-trees, passes up mountain side, and sinks at places several feet in red soil. At the top of the ridge road follows the edge of a precipice, from which it is protected by a stone parapet

Road descends into a valley to Chapalilla (23 hrs.' ride, about 55 m.). Several small streams are crossed. There are stretches of level sandy road, followed by rough and stony sections. Colima volcano seen in the distance. Marquesado ($26\frac{1}{2}$ hrs., about 63 m.) at the foot of a rugged hill; country otherwise level. Ahuacatlan?, town (29 hrs., about 69 m.). Beyond the town road crosses the frontier of the State of Jalisco. Etzatlan (30 hrs., about 71 m.). A stream is crossed by a stone bridge at the entrance of the city. Beyond the city the road, stony and mostly paved, descends steeply. From here there is a short cut, by a steep and very bad track, through the Barranca (36 hrs.) and Planes? (38 hrs.), which rejoins main road before reaching Mochitiltic (41 hrs., about 89 m.). Road passes through bare rolling country, then ($44\frac{1}{2}$ hrs.) descends into the plain partly occupied by the Lagoon of Magdalena; village of the same name ($46\frac{1}{2}$ hrs., 98 m.). Beyond the village road follows a mountain ridge, passes over it, and winds by very steep grades into the valley to Tequila, city ($51\frac{1}{2}$ hrs., 108 m.). Dusty road across bare level country to Amatitlan, village (54 hrs., 113 m.). Road rises steeply through the village, paving in bad condition, to a ridge, beyond which it continues level. Rocks and hills, mostly bare, in neighbourhood. Arenal, ? congregacion ($55\frac{1}{2}$ hrs., 116 m.). Road passes through pine-forest, and reaches the railway line (Appendix III, Section xxix) at Orendain (57 hrs.,¹ 126 m.). Road runs close to railway. La Venta or Venta del Astillero? (60 hrs., about 135 m.). Road broad, but very dusty and sandy, deeply furrowed in parts. Neighbouring country somewhat bare, a few maize-fields and isolated pine-trees. Guadalajara (65 hrs., about 150 m.), city.

Another route is through Ixtlan (about 80 m.) and San Marcos (111 m.), and thence by rail to Guadalajara (189 m.), see Appendix III, Section xxix. It leaves the route described above apparently beyond Ahuacatlan. There is a regular service of diligences along this route between Tepic and San Marcos.

¹ The diligence covers the distance from Tequila to Orendain in 6 hrs., but only takes $5\frac{1}{2}$ hrs. on the return journey.

ROUTE 28

GUADALAJARA-QUERETARO, 287 miles

Direction E. This route is a continuation of Route 27, and lies along the old highway to Mexico City. Beyond Santa Maria, near Lagos, it runs within a short distance of the railway (Appendix III, Section vi). Guadalajara is connected with Queretaro by a railway line via Irapuato (Appendix III, Sections xxix, vi), distance by rail, 232.5 m.) The road is suitable for wheeled traffic throughout, but in certain sections it is reported to be very rough. There is a diligence service between San Juan de los Lagos and Santa Maria (time $3\frac{1}{2}$ hrs.). Distances from Guadalajara : Puente de Tololotlan (14 m.). Zapotlanejo, town (21 m.). Puente de Calderon (27 m.). Tierra Colorada (45 m.). Tepatitlan, village (53 m.). Venta de Pegueros (71 m.). Jalostotitlan or ? Jalostitlan, town (89 m.). San Juan de los Lagos, city (100 m.). A road leads N. to Aguascalientes ; see Route 29 (A). Present route goes E. Santa Maria (119 m.). Road appears to run near the railway. Lagos, city (148 m.). Portugalejo (156 m.). Posta (162 m.). Saucillo (169 m.). Lagunilla, hacienda (172 m.). Road enters State of Guanajuato. Leon, city (180 m.). Magueyes (186 m.). Aguirres (188 m.). San Isidro (190 m.). Sauces, hacienda (192 m.). Silao de la Victoria, city (200 m.).¹, Medio Sitio, hacienda (207 m.). Calera, hacienda (213 m.). Lo de Juarez (214 m.). Garrida, hacienda (217 m.). Arandas, hacienda (219 m.). Irapuato, city (223 m.). Road intersects a track from Morelia to Guanajuato ; see Route 55. Soledad, hacienda (233 m.). Salamanca, city (236 m.). Molino de Sarabia, hacienda (250 m.). Guaje, village (254 m.). Celaya, city (260 m.). From here diligences run to Santa Cruz (distance 18 m., time 4 hrs.). Apaseo, town (269 m.). Ranchito (273 m.). Calera (276 m.). Estancia de las Vacas, ? hacienda (281 m.). Queretaro, city (287 m.).

¹ According to another estimate the distance from Lagos to Silao is only 47 m. (instead of 52).

ROUTE 29

GUADALAJARA-AGUASCALIENTES

Direction NE. For railway communication via Irapuato see Appendix III, Sections xxix and vi; distance by rail 310 m. There are two roads:

(A) Along the old highway described in Route 28, as far as San Juan de los Lagos (100 m.), where route branches off to N. via Encarnacion de Diaz, city (121 m.), and enters the State of Aguascalientes. Peñuelas, hacienda (135 m.). Aguascalientes, city (149 m.). The road is said to be fit for wheeled traffic.

(B) *Via Nochistlan*. The nature of the road is not stated, but there is a diligence service from Teocaltiche to Incarnacion station (distance 35 m.); time $10\frac{1}{2}$ hrs., but only $9\frac{1}{2}$ hrs. for return journey). Route (A) is joined at Encarnacion. Distances from Guadalajara: Cuquio, town (13 m.). Yahualica, town (39 m.). Road enters State of Zacatecas. Nochistlan, city (57 m.). Road re-enters State of Jalisco. Teocaltiche, city (83 m.). Tequezquite, hacienda (94 m.). Encarnacion de Diaz, city (115 m.); thence by Route (A). Aguascalientes, city (143 m.).

ROUTE 30

GUADALAJARA-ZACATECAS

Direction NNE. For railway communication via Irapuato, see Appendix III, Sections xxix and vi; distance by rail, 385 m. The road is said to be fit for wheeled traffic almost throughout. Diligences run from Jerez to Zacatecas in $6\frac{1}{2}$ hrs.; the return journey takes only $4\frac{1}{2}$ hrs. Distances from Guadalajara: Atemajac, village ($2\frac{1}{2}$ m.). Zapopan, town (5 m.). Copala, hacienda (13 m.). Milpillas (24 m.). Colchon (42 m.). San Cristobal, village (44 m.). Estanzuela, village (65 m.). Road passes into the State of Zacatecas shortly before Estanzuela. Ceja (71 m.). Tetillas (78 m.). San Juan del Teul, village (90 m.). Santa Maria, village (103 m.). Tepeschitlan, village (115 m.). Telesteipa (117 m.). Cicalco, village

(118 m.). Sanchez Roman or Tlaltenango, city (122 m.). Momax, village (139 m.). Road passes again into the State of Jalisco. Colotlan, city (145 m.). Canoas (147 m.). Santa Maria de los Angeles, town (150 m.). Animas (152 m.). Lajas (156 m.). Guanajuatillo (158 m.). Cacalote (160 m.). Huejucar, village (162 m.). Road recrosses into Zacatecas. Viboras, hacienda (167 m.). Tepetongo, village (172 m.). Arroyo Seco (183 m.). Ermita (187 m.). Ojo de Agua (192 m.). Jerez or Ciudad Garcia, city (195 m.). Media Luna (204 m.). El Orito (224 m.). Cinco Señores (225 m.). Zacatecas, city (226 m.).

From Guadalajara Zacatecas can also be reached via Aguascalientes (Routes 29 and 38). Total distance by this alternative, about 223 miles.

ROUTE 31

GUADALAJARA-ZAMORA

Direction SE. The towns are connected by a railway (Appendix III, Section xxix) ; distance by rail, via Yurecuaro, 100 m. Various routes can be followed :

(A) Along the railway from Guadalajara to Barca ($67\frac{1}{2}$ m.), then by a road which, on leaving Barca, city, crosses the frontier of the State of Michoacan, passes through Ixtlan, village (about 78 m.) to Zamora, city (about 97 m.).

(B) A road or track going S. through Tlajomulco, town (about 19 m.), Jocotepec (about 32 m.), on Lake Chapala ; the road follows the S. bank of the lake, passing through Tuxcueca, village (about 60 m.), Sahuayo (about 82 m.), first town in the State of Michoacan, Jiquilpan, city (87 m.), Totolan, village (90 m.), Guaracha, hacienda (98 m.), Guarachita or Huarachita (100 m.), Chavinda, village (113 m.), Hacienda del Llano (116 m.), Santa Monica Ario, village (124 m.), to Zamora, city (131 m.).¹

(C) By road to Chapala (about 37 m.), following Route 33,

¹ According to another account the distance from Jiquilpan to Zamora is 33 m. instead of 44 m

then by steamer on Lake Chapala and up the Rio Grande de Santiago, also called Rio Zula, to Ocotlan, village (77 m.), where Route (A) is rejoined. Steamers take 4 hrs. From Ocotlan diligences run N. to Tototlan (distance 19 m., time 4 hrs. from Ocotlan to Tototlan, but only 3 hrs. on return journey). By this route the total distance would seem to be about 130 m.

ROUTE 32

CHAMELA (Jalisco) GUADALAJARA, about 184 miles

Direction NE. No railway communication. A wagon road, built in 1913, leads from Chamela, a village on the Pacific coast, to Purificacion, town (about 19 m.). Thence a track is followed to Autlan city (about 41 m.). Tracks come in from Manzanilla and Colima. Present route passes through Tecolotlan, village (about 88 m.), and Cocula, city (about 112 m.). Beyond Cocula there is a carriage road via Saucedo (about 121 m.), Villa (about 124 m.), San Pablo (about 125 m.), Aguascalientes (about 127 m.), to La Vega (134 m.). Diligences run from Cocula to La Vega in $4\frac{1}{2}$ hrs., return journey in $4\frac{1}{4}$ hrs. During the rainy season the service has to be suspended. From La Vega the journey is continued by rail to Guadalajara (184 miles); see Appendix III, Section xxix.

ROUTE 33

GUADALAJARA-CHAPALA, about 37 miles

Direction SSE. By rail as far as Atequiza (25 m.), see Appendix III, Section xxix; then by road through undulating country. The road is comparatively level and bordered with low stone walls. Fairly steep descent into Chapala, town (37 m.). It is used by coaches drawn by mules (generally 8 mules), and by motor-cars. In 1909 it was reported to be 'full of rocks and ruts', but steps were being taken to improve it all the way from Guadalajara to Chapala. In Chapala the road is cobbled.

ROUTE 34

MANZANILLA-COLIMA, 86 miles

Direction SE. as far as Armeria, then NE. A railway runs near the road, see Appendix III, Section xxviii; distance by rail, 60 m. From the Pacific port of Manzanilla, the road follows a sand dune stretching between the ocean and a long lagoon, passing through Campos (3 m.), Ciruelo (14 m.), Cuijutlan (24 m.), a hacienda on the lagoon, Cuyutancillo (27 m.), Chico (29 m.), and Armeria, hacienda (37 m.). At m. 40 road crosses Rio de la Armeria or Rio Tuscacuesco and follows up the l. bank. San Bartolo (55 m.). Rosario, hacienda (68 m.). Jala (73 m.). Coquimatlan, village (78 m.). Colima (86 m.), on broad plateau, covered with fields of maize, sugar cane, coco palms.

ROUTE 35

COLIMA-GUADALAJARA

Direction NNE. This is a continuation of Route 34. The towns are linked up by railway, see Appendix III, Section xxviii; distance by rail 162 m. Two roads are available:

(A) *Via Tonila*. Before the construction of the railway this was the chief trade route to Guadalajara and Mexico City. The road varies considerably; in some sections it is broad, level, and provided with stone parapets, in others it is very steep and barely wide enough for the passage of mules in single file (?). In many places it is liable to be seriously damaged by floods or becomes altogether impracticable in the rainy season. The cobble pavements, where they exist, have to be renewed yearly. From Colima the road rises along the E. slope of the Colima volcano, passing over wide lava fields and through deep gorges with precipitous sides. Surface of road very rugged.

There are few inhabited places. Garita (3 m.). Trapiche (5 m.). Zapote (11 m.). Loma Alta (13 m.). Alcaraces

(20 m.). Queseria, hacienda (22 m.). Tonila, village (27 m.).¹ Just before reaching the village the road crosses the frontier of the State of Jalisco. Road improves and is fairly level; carts travel at a fair pace through Platanar and Atenquique to Zapotlan or Ciudad Guzman (59 m.), a straggling city in a broad valley. From here diligences used to reach Guadalajara in two days. The road is very rugged, passing over fields of lava, then crossing in a straight line the dry bed of a lake. Total absence of water except in a few side valleys. San Marquito, a place where soda is extracted. From San Sebastian the road, covered a foot deep with white dust, leads down to Amatitlan hacienda and to Sayula (77 m.), a city in uninviting surroundings. The road passes now alternately over sandy fields and dry beds of lakes. Techaluta is a poor village situated between two such lakes. Amacueca (88 m.), a village with water and fine gardens. Road ascends a ridge and continues on a plateau to the town of Zacoalco de Torres (108 m.). Road crosses a lake, which dries up annually (it was quite dry in March-April 1897), leaves the valley across a lava field (very rugged), and enters another broad valley. Las Higueras, rocky heights to l. of road. Good road through plantations of sugar-cane to Santa Ana Acatlan (112 m.), a large village. Beyond the village the road crosses La Coronilla, a lava ridge, and becomes very difficult. Attempts have been made to pave this section. Road, again sandy to Santa Cruz or Tlajomulco? (129 m.), passes over a high plateau of soft white soil into which vehicles wear deep ruts. In dry weather the dust is usually a foot deep. Guadalajara, city (144 m.).

(B) *Via Tuxpan*. This route affords an alternative between Colima and Zapotlan. Nature of road not stated. It passes through San Joaquin (5 m.), Huerta, hacienda (10 m.), Potrero de Eriza (17 m.); road enters State of Jalisco; Higueras, hacienda (30 m.), Espanatica, congregacion (43 m.), Tuxpan, congregacion (53 m.), Zapotiltic, village (58 m.), Huescalapa,

¹ Tonila can also be reached via Camichin (13 m.), and Albarrada (26 m.). Distance by this route, 31 m.

hacienda (60 m.), Zapotlan or Ciudad Guzman (63 m.). Thence by Route (A) to Guadalajara (148 m.).

ROUTE 36

COLIMA-ZAMORA (Michoacan), 185 miles

Direction NE. Railway communication only exists via La Junta near Guadalajara, see Appendix III, Sections xxviii and xxix; distance by rail 254 m. The nature of the road between Colima and Jiquilpan is not stated; beyond that point it is suitable for wheeled traffic. As far as Tonila Route 35 (A) is followed. The distances from Colima are: Tonila, village (27 m.). San Marcos (34 m.). Bocas (40 m.). Platanar (50 m.). Road passes through deep gorge. Tinguingue (58 m.). Zapotiltic, village (66 m.). Road crosses Route 35 (B) and passes through another deep gorge. Rio Cubianes (71 m.). Tamazula or Gordiano, town (78 m.). Contla, hacienda (84 m.). El Veladero (98 m.). Trompetas (112 m.). Corrales (126 m.). In this neighbourhood road enters State of Michoacan. Jiquilpan, city (141 m.). Here road rejoins Route 31 (B) to Zamora (185 m.) By following Route 35 (B) as far as Zapotiltic the total distance would apparently be reduced to 177 m.

ROUTE 37

COLIMA-COALCOMAN (Michoacan), 166 miles

Direction SE. No railway communication. Nature of road not stated. It appears to be mainly a horse-track. Distances from Colima: Cautlan (13 m.). Chinacamitlan (21 m.). Chamila (23 m.). Jolostan (27 m.). Tepostitlan (31 m.). Estapilla or Estampilla (44 m.). Malique (54 m.). Plaza de Coahuayana (65 m.). Route enters State of Michoacan. Coahuayana de Michoacan, village (72 m.). Chincuila or Chincuilu, village. Coalcoman, town (166 m.). For continuation to Morelia see Route 52.

ROUTE 38

AGUASCALIENTES-ZACATECAS

Direction NNW. The railway appears to run more to the E., see Appendix III, Section vi; distance by rail 75 m. Two roads, both apparently fit for wheeled traffic, can be followed.

(A) *Via Refugio*. Distances from Aguascalientes : Refugio, rancho (12 m.). San Antonio (25 m.). San Jacinto, hacienda (33 m.). In this neighbourhood road enters the State of Zacatecas. San Francisco (39 m.). Refugio, town (53 m.). Zacatecas, city (74 m.).

(B) *Via Guadalupe*. Bocas (3 m.). San Lorenzo, hacienda ($7\frac{1}{2}$ m.). Chichimeco, hacienda (14 m.). Garabato, hacienda (21 m.). Santiago, hacienda (27 m.). Pabellon, hacienda (30 m.).¹ From here a road leads to the city of Rincon de Romos, $2\frac{1}{2}$ m. away. San Pedro, hacienda (46 m.). Before reaching this locality road enters the State of Zacatecas. Meson de Tlacote (62 m.). Guadalupe, town (72 m.). Several roads meet here : see Routes 39, 40. Zacatecas (75 m.).²

ROUTE 39

ZACATECAS-QUERETARO, 234 miles

Direction SE. There is a railway connexion via Leon, see Appendix III, Section vi; distance by rail 286 m. The route follows the old high road to Mexico. Distances from Zacatecas : Guadalupe, town (4 m.). Refugio (21 m.). San Diego (32 m.). San Francisco, town (35 m.). Tepetate (47 m.). Cienega Grande (60 m.). Campos, hacienda (81 m.). Milagro (84 m.). Encinillas (88 m.). Matancillas (95 m.). Ojuelos (100 m.). Road crosses a small strip of territory belonging to the State of Jalisco. San Carlos (102 m.). Road enters State of Guanajuato. El Vaquero or Ocampo, village (116 m.).

¹ According to another estimate the distance from Aguascalientes to Pabellon is only 24 m. ; by rail it is 19 m.

² According to the other estimate the total distance is 69 m.

Tlachiquera, hacienda (124 m.). San Felipe or Ciudad Gonzalez (141 m.). Quemada, hacienda (154 m.). Arroyo Forlon (157 m.). San Elias (159 m.). Trancas, hacienda (163 m.). Presa (167 m.). Dolores Hidalgo, city (173 m.). Road crosses Route 62. Rio de la Erre (177 m.). La Erre, hacienda (178 m.). Arroyo de la Caja (183 m.). Rio de San Antonio (187 m.). Atotonilco (188 m.). San Miguel de Allende, city (195 m.). El Puente (203 m.). Cerritos, hacienda (205 m.). Santas Marias, hacienda (208 m.). Ricos (210 m.). Monjas (213 m.). Buenavista, hacienda (215 m.). In this neighbourhood road enters the State of Queretaro. Santa Catarina (218 m.). Santa Rosa, village (220 m.). Alvarado, hacienda (226 m.). San Pablo (228 m.). Queretaro, city (234 m.).

Queretaro can also be reached by following Route 38 to Aguascalientes (74 m.), then by Route 47 to Lagos, city (129 m.), finally by Route 28 to Queretaro (268 m.).

ROUTE 40

SALTILLO (Coahuila)-ZACATECAS, 298 miles ¹

Direction SSW. Railway communications exist via San Luis Potosi, distance 439 m., and via Torreon, distance 457 m. Appendix III, Sections vii and vi). Nature of road not stated; probably only a track. Route 20 is followed from Saltillo to San Juan de la Vaqueria, hacienda (27 m.), whence present route branches off to S. Puerto del Capulin (36 m.). Santa Elena (57 m.). Beyond this point road enters the State of Zacatecas. Bonanza, hacienda (82 m.). Cedros, hacienda (109 m.). Candelaria (140 m.). Gruñidora, hacienda (161 m.). Charco del Muerte (168 m.). Gato (186 m.). Barranquita (199 m.). Sierra Hermosa, hacienda (207 m.). Zancarron (225 m.). San Cosme, village ? (244 m.). Bañon, hacienda (262 m.). San Antonio, hacienda (279 m.). Guadalupe, town (294 m.). Zacatecas, city (298 m.).¹

¹ According to another estimate the total distance is only 249 m.

ROUTE 41

ZACATECAS-SAN LUIS POTOSI, 116 miles

Direction ESE. Distance by railway 197 m., see Appendix III, Section vi. Nature of road not stated. Between Salinas and San Luis Potosi it appears to run near the railway. Distances from Zacatecas: Trancoso, hacienda (11 m.). Blanca, village (31 m.). Gacho (44 m.). In this neighbourhood road enters the State of San Luis Potosi. Salinas, city (62 m.). Espiritu Santo (78 m.). Elotes (93 m.). San Luis Potosi, city (116 m.).

ROUTE 42

ZACATECAS-VILLANUEVA, 45 miles

Direction SW. There is a carriage road. A regular diligence service (time 7 to 8 hours) connects Villanueva with the railway station of Zacatecas.

ROUTE 43

SYMON-SAN JUAN DE GUADALUPE (Durango), 15½ miles

Direction WSW. There is a carriage road connecting the town of San Juan de Guadalupe with the station of Symon (see Appendix III, Section vi). Diligences run daily, time 2¼ hrs.

ROUTE 44

CAÑITAS (Zacatecas)-NIEVES, 44 miles

Direction NNW. A carriage road connects the city of Nieves with the station of Cañitas (see Appendix III, Section vi). Diligences run daily via Rio Grande (30 m) to Nieves (44 m.); they take 5 hrs. to Rio Grande, 8½ hrs. to Nieves, but 9 hrs. on the return journey.

ROUTE 45

LA HONDA-PINOS (Zacatecas), 25 miles

Direction SE. A carriage-road connects the city of Pinos with the station of La Honda (see Appendix III, Section vi).

Diligences run daily from La Honda to Pinos in 4 hrs. and return in $4\frac{1}{2}$ hrs.

ROUTE 46

AGUASCALIENTES-SAN LUIS POTOSI, 107 miles

Direction E. The cities are connected by railway via Salinas, see Appendix III, Section vi; distance by rail 140 m. The road is more direct, but its present condition is not known. Distances by road from Aguascalientes: Ledesma, hacienda (26 m.). Before reaching this locality road enters the State of Jalisco. Ojuelos, town (60 m.). Road crosses Route 39 and enters the State of San Luis Potosi. Gallinas (76 m.). Tepe-tate, hacienda (89 m.). San Luis Potosi, city (107 m.).

ROUTE 47

AGUASCALIENTES-GUANAJUATO, 123 miles

Direction SE. The two cities are connected by railways via Silao, see Appendix III, Section vi; distance by rail, 141 m. Between Lagos and Silao the present route follows the old highway to Mexico. From Aguascalientes to Lagos the nature of the road is not stated; in the remaining sections it is said to be fit for wheeled traffic. Distances from Aguascalientes: San Bartolo (13 m.). Los Sauces (24 m.). In this neighbourhood road enters the State of Jalisco. Caquistle (37 m.). Lagos, city (55 m.). From this point Route 28 is followed up to Silao de la Victoria, city (107 m.). At the last-named city present route turns E. to Guanajuato, city (123 m.).

ROUTE 48

AGUASCALIENTES-CALVILLO, 36 miles

Direction W. A carriage-road connects the city of Calvillo with the railway station at Aguascalientes. Diligences run daily in both directions. Distances from Aguascalientes: Venadero, hacienda (12 m.). Sauz (22 m.). Tepezalilla (34 m.). Calvillo, city (36 m.).

ROUTE 49

AGUASCALIENTES-ASIENTOS or OCAMPO, 35 miles

Direction NE. For railway communication, see Appendix III, Section vi; distance by rail 38 m. Nature of road not stated. Distances from Aguascalientes: Cañada Honda (8 m.). Santa Maria, hacienda (16 m.). Tule, hacienda (21 m.). Viudas (23 m.). Hacienda Vieja (30 m.). Asientos or Ocampo, city (35 m.).

ROUTE 50

ZAMORA-MORELIA, 111 miles

Direction ESE. For railway communication, see Appendix III, Sections xxix, vi, xi and xii; distance by rail 254 m. The road is said to be suitable for wheeled traffic. It forms a continuation of Routes 31 and 36. Distances from Zamora: Tuna (3 m.). Espiritu Santo, hacienda (4 m.). Santiaguillo, hacienda (5 m.). Icatiro, hacienda (12 m.). Tlazazalca, village (16 m.). Purepero, town (21 m.). Caurio, village (37 m.). Zipimeo, hacienda (50 m.). San Pedro, village (87 m.). Cuto, village (98 m.). Morelia, city (111 m.).

ROUTE 51

MORELIA-MEXICO, 200 miles

Direction E. Route follows the old highway to Mexico City; in 1912 the section from Toluca to the capital was being reconstructed. Railway connexion exists via Acambaro, see Appendix III, Sections xii and xi; distance by rail 234 m. The road is more direct. Between Morelia and Maravatio two other roads are available besides the highway described below, one following the railway line (96 m.), the other being a horse-track somewhat more direct than the main road, leaving the latter at the town of Zinapecuaro (34 m.) and passing through the village of Ucareo (47 m.) to Maravatio (73 m.).

Along the main road the distances from Morelia are: Ata-

paneo, hacienda (9 m.). Goleta, hacienda (10 m.). Charo?, town (13 m.). Indaparapeo, village (21 m.). San Lucas Pio, village (27 m.). Querendaro, village (29 m.). Route 66 branches off NE. Zinapécuaro, town (34 m.). A good carriage-road connects the town with the station of Huingo; in 1910 diligences covered the distance in $1\frac{1}{2}$ hr. San Isidro, hacienda (52' m.). San Nicolas, hacienda (57 m.). San Miguel, hacienda (60 m.). San Joaquin, hacienda (65 m.). Maravatio, town (78 m.). Pomoca, hacienda (88 m.). Buenavista, hacienda (91 m.). Tepetongo, hacienda (99 m.), Vertice Puerto de Medina (104 m.). Road enters the State of Mexico (106 m.). Venta del Aire (108 m.). La Jordana (112 m.). Puente de Santiago (115 m.). Venta Puente Arcivar (117 m.). Torrecillas (122 m.). Venta de San Jose (126 m.). Ixtlahuaca, town (137 m.). Puente de D. Bernabé, a bridge across Rio Lerma (144 m.). Venta de Jesus Maria (146 m.). Puente de Palmillas (154 m.). Toluca, city (160 m.). Lerma, city (170 m.). Jajalpa, hacienda (174 m.). Rio Hondo, village (176 m.). Puente Llano de Salazar. Puente de Agua de Gallinas. Piramide. Cumbre de las Cruces (181 m.). Casa de la Pila. Maromas (184 m.). Tianguillo ($184\frac{1}{2}$ m.). Contadero, opposite village of Cuajimalpa (187 m.). Santa Fe, village (192 m.). Molino de Belem (193 m.). Tacubaya (195 m.). Chapultepec, village (197 m.). Mexico City (200 m.).

ROUTE 52

COALCOMAN (Michoacan)—MORELIA

Direction NE. The present route constitutes a continuation of Route 37. Railway communications exist only between Uruapan and Morelia (Appendix III, Section xii). Various roads are available.

(A) *Via Apatzingan*. As far as Uruapan a sinuous horse-track, partly shaded beyond Apatzingan, is followed. At Uruapan a carriage-road is joined. According to information of 1910 the latter has been much neglected since the opening of the railway; after rain it is almost impassable. Distances

from Coalcoman : San Isidro, hacienda (67 m.). Apatzingan, city (114 m.). Huerta, hacienda (120 m.). Paracuaro, town (129 m.). Bancos, hacienda (132 m.). Cutzato, ? village (161 m.). Jucutacato, village (167 m.). Jicalan, village (170 m.). Uruapan, city (176 m.). Santa Catarina (182 m.). Zirimicuaro, hacienda (190 m.). Ziracuaretiro, village (196 m.). San Juan Tumbio (208 m.). Ajuno, village (214 m.). Patzcuaro, city (224 m.). Tiripetio, village (243 m.). Undameo, village (248 m.). Morelia, city (263 m.).

(B) *Via Paracho*. A horse-track rejoining main road at Patzcuaro. Distances : Tepalcatepec, village (77 m.). Periban de Ramos, town (140 m.). San Francisco Periban, village (142 m.). Zacan, village (158 m.). Corupo, village (163 m.). San Felipe, village (168 m.). Paracho, town (181 m.). Aranza, village (184 m.). Cheran, village (188 m.). Nahuatzen, village (195 m.). Sevina, village (198 m.). Pichataro, village (206 m.). Ajuno, village (216 m.). Patzcuaro (227 m.). Thence by Route (A) to Morelia (266 m.).

(C) *Via Tancitaro*. Along Route (B) to Tepalcatepec (77 m.), then by a horse-track via Buenavista Tomatlan, village (103 m.) and Tancitaro, town (131 m.) to Uruapan (170 m.). From here Route (A) is followed to Morelia (257 m.).

ROUTE 53

MORELIA-ZITACUARO (Michoacan)

Direction ESE. Railway communications exist via Acambaro (see Appendix III, Sections xii and xi), distance by rail 148 m., but the roads are more direct. Two routes are available.

(A) *Via Tajimaroa*, along a track which leaves the old highway to Mexico (Route 51) at Querendaro, village (29 m.) and passes through Tajimaroa, village (58 m.). Santa Rosa, hacienda (62 m.). San Lorenzo, village (66 m.). Turundeo (70 m.). Tuxpan, village (75 m.). Zirihuato (87 m.). Zitacuaro, city (96 m.).

(B) *Via Irimbo*, along a track which leaves Route 51 at

Maravatio (78 m.),¹ passes through the village of Irimbo (93 m.), rejoins Route (A) at San Lorenzo (98 m.) and continues along it to Zitacuaro (128 m.).

ROUTE 54

MORELIA-HUETAMO (Michoacan)

Direction S. No railway communication. Various roads are available.

(A) The main road, Route 52 (A), is followed to Tiripetio, village (20 m.); thence by a horse-track through Acuitzio, town (25 m.). Tacambaro, city (57 m.). A track goes NW. to Ario, on Route 79, distance 25 m. Santa Rosa, hacienda (62 m.). San Antonio de las Huertas, hacienda (86 m.). Several ranchos. Cutzeo, village (171 m.?). Huetamo, town (172 m.). From here a track continues SE. to Coyuca in the State of Guerrero, see Route 83.

(B) The main road, referred to above, is followed to Patzeuaro (39 m.); thence by a horse-track, very fair in dry season, through various ranchos, to Tacambaro (71 m.), where Route (A) is rejoined; Huetamo (186 m.).

(C) A horse-track through Huerta, hacienda (5 m.), and Coincho (11 m.?) to Undameo (17 m.), thence by Route (A) to Huetamo (174 m.).

(D) A horse-track going direct from Morelia, through various ranchos, to San Antonio de las Huertas (71 m.), passing to the E. of the city of Tacambaro. From San Antonio de las Huertas Route (A) is followed to Huetamo (157 m.).

ROUTE 55

GUANAJUATO-MORELIA, 112 miles

Direction S. The cities are connected by railway, see Appendix III, Sections vi, xi and xii; distance by rail 170 m. The nature of the road is not stated; some sections may be suitable for wheeled traffic, but the Lagoon of Copandaro, which has to be crossed in canoes, renders through traffic by

¹ Or 73 m. by the short track referred to in Route 51.

carts impossible. The road is more direct than the railway. Distances from Guanajuato: Marfil, village and mines ($2\frac{1}{2}$ m.). A road goes W. to Silao, see Route 60. Cuevas, hacienda (6 m.). Burras (10 m.). Irapuato, city (25 m.). Road meets Route 28. Salamanca, city (38 m.). Valle de Santiago, city (48 m.). San Jeronimo, hacienda (58 m.). Yuriria or Yuririapundaro, town (66 m.). Uriangato, village (73 m.). Road enters the State of Michoacan. Cuitzeo, town on N. bank of lagoon (84 m.). Lagoon crossed by canoe. Copandaro (93 m.), (?) village on S. bank of lagoon. Tarimbaro, village (103 m.). Morelia, city (112 m.).

From Burras a more direct track goes via Temascatio, hacienda (21 m.) to Salamanca (30 m.), shortening the total journey by 8 miles.

ROUTE 56

GUANAJUATO-ZAMORA (Michoacan), 84 miles

Direction SW. Distance by railway 150 m., see Appendix III, Sections vi and xxix. In many sections the road appears to run near the railway. It is apparently suitable for wheeled traffic. From Guanajuato Route 55 is followed as far as Irapuato (25 m.), where the present route branches off SW. to Penjamo, city (58 m.). Road intersects Route 58; a track goes ESE. to Salvatierra, see Route 65. Present route goes through Piedad Cabadas or La Piedad, city, to Zamora, city (84 m.).

ROUTE 57

MORELIA-PIEDAD CABADAS (Michoacan), 112 miles

Direction NW. There are no railway communications between the cities except by a long détour via Celaya (Appendix III, Sections xii, xi, vi and xxix); distance by rail 202 m. The high road to Zamora (Route 50) is followed as far as San Pedro (24 m.); beyond this point the nature of the road is not stated. It passes through Cuatro, hacienda (40 m.), Angamacutiro, town (68 m.), Santa Fe del Rio, village (83 m.), Guandaro, hacienda (88 m.), Tepusa, hacienda

(91 m.), Numaran, village (104 m.), to the city of Piedad Cabadas or La Piedad (112 m.). Here it links up with Route 56.

ROUTE 58

LEON (Guanajuato)—MORELIA, 136 miles

Direction SSE. Railway connexion via Irapuato and Celaya, see Appendix III, Sections vi, xi and xii; distance by rail 176 m. Nature of road not stated; probably suitable for wheeled traffic most of the way, but some rivers have to be forded. Diligences run daily between the railway station of Penjamo and Puruandiro (time 7 hrs.). Distances from the city of Leon: Tultitlan or Tultitan (17 m.). Puerto de San Juan (25 m.). Cueramaro, village (30 m.). Rio Turbio is forded. Penjamo, city (53 m.). Rio Turbio is recrossed before entering the city. Road intersects Route 56. Berumbo or Berumo. Zurumuato. Road enters State of Michoacan in this neighbourhood. Tres Mezquites. La Caña. Janamuato, village. Puruandiro, city (83 m.). Batuecas (88 m.). Tende-paracua, village (102 m.). Morelia, city (136 m.).

ROUTE 59

GUANAJUATO—QUERETARO, 89 miles

Direction SE. Railway connexion via Celaya, see Appendix III, Section vi; distance by rail, 100 m. Along Route 55 to Salamanca (38 m.), thence by Route 28 to Queretaro (89 m.).

ROUTE 60

GUANAJUATO—SAN LUIS POTOSI, 135 miles

Direction N. The railway makes a long détour through Aguascalientes (Appendix III, Section vi); distance by rail, 280 m. Nature of road not stated. On leaving Guanajuato Route 55 is followed to Marfil ($2\frac{1}{2}$ m.). Present route turns W. to Silao, city ($12\frac{1}{2}$ m.), then N. to Coecillo, hacienda (15 m.). Chichimequillas, hacienda (24 m.). Arperas (30 m.). Tlachi-quera, hacienda (37 m.). San Juan de los Llanos, hacienda

(52 m.). Meson de la Partida (53 m.). Arrastres (57 m.). Obra (62 m.). Huerta (70 m.). San Felipe or Ciudad Gonzalez (73 m.). Road crosses Route 39. Tepeaca (77 m.). Puente de San Bartolo (79 m.). San Bartolo, hacienda (86 m.). Jaral, hacienda (93 m.). Villela Estancia (101 m.). In this neighbourhood road enters State of San Luis Potosi. Tierras Blancas (114 m.). Pila, hacienda (122 m.). Real de Pozos, village ? (130 m.). San Luis Potosi, city (135 m.).

A somewhat shorter road branches off at Jaral (93 m.). Estancia de Lucio (97 m.). Refugio (99 m.). Puerto de Sauces (100 m.). Arroyo Alcantarilla (102 m.). Zavala (104 m.). This rancho is in the State of San Luis Potosi. Arroyo de Zavala (105 m.). Valle de San Francisco, town ? (106 m.). Jesus Maria, hacienda (114 m.). Estancia (116 m.). Ojo de Agua or Ojo del Gato (118 m.). Cerritos (120 m.). Arroyo Yerbabuena (122 m.). Arroyos (124 m.). Arroyo Cantera (125 m.). Joya (127 m.). San Luis Potosi (132 m.).

ROUTE 61

GUANAJUATO-CELAYA, 73 miles

Direction SE. Railway communications via Silao (Appendix III, Section vi) ; distance by rail, 71 m. Nature of road not stated. Distances from Guanajuato : Pulque (7 m.). Santa Catarina (23 m.). San Miguel de Allende, city (43 m.). Road meets Route 39 and appears to follow railway closely. Chamacuero, town ? (59 m.). Rio Lerma is crossed twice. Celaya, city (73 m.).

ROUTE 62

GUANAJUATO-SAN DIEGO DE LA UNION, 55 miles

Direction NE. No railway communications. There is only a horse-track. Distances from Guanajuato : Quintero (18 m.). Charco Azul (24 m.). Dolores Hidalgo, city (26 m.). Road crosses Route 39. Rincon (30 m.). Trojes (32 m.). San Diego de la Union, town (55 m.).

ROUTE 63

SAN FELIPE OR CIUDAD GONZALEZ-XICHU (Guanajuato),
88 miles

Direction E. There is a railway from San Felipe to San Luis de la Paz, see Appendix III, Section vii ; distance by rail, 62 m. Nature of road not stated. Distances from San Felipe : El Cubo, hacienda (6 m.). San Diego de la Union, town (19 m.). Saucedo, hacienda (37 m.). San Luis de la Paz, city (63 m.). A road goes SSW. to the city of San Miguel de Allende, distance 37 m. Xichu, village and mine (88 m.).

At San Felipe road links up with Routes 39 and 60.

ROUTE 64

GUANAJUATO-PIEDRA GORDA

Direction W. No railway communication. There are two roads :

(A) Along Route 47 to Silao (16 m.), then along Route 28 to Leon (36 m.). From this point the road continues suitable for wheeled traffic. Diligences connect San Francisco with the station of Leon (time 3 hrs.). The following localities are passed : Purisima del Rincon, village (45 m.). San Francisco del Rincon, city (48 m.). Piedra Gorda or Ciudad Manuel Doblado ? (71 m.).

(B) A more direct road, the nature of which is not stated, goes from Silao (16 m.), through Romita, village (22 m.), Amoles (27 m.), Puerta de San Juan (42 m.), to Piedra Gorda (64 m.).

ROUTE 65

PENJAMO-JERECUARO (Guanajuato), 108 miles

Direction E. Nature of road not stated. Distances from the city of Penjamo : Pantoja, hacienda (27 m.). Valle de Santiago, city (50 m.). Salvatierra, city (68 m.). Road intersects Route 67. Puerto de Ferrer (94 m.). Vallecillo (101 m.). Jerecuaro, town (108 m.).

ROUTE 66

MORELIA-QUERETARO, about 118 miles

Direction NE. For railway communications via Celaya see Appendix III, Sections xii, xi, and vi; distance by rail, 128 m. Since the opening of the railway the carriage-road has been much neglected; after rain it is reported to be almost impassable. Route 51 is followed from Morelia to Querendaro (29 m.), where road turns NE., crosses the frontier of the State of Guanajuato, and passes through Acambaro, city (about 60 m.), Jerecuaro, town (81 m.), Fresno, hacienda (88 m.), Barranca, hacienda (105 m.). In this neighbourhood road enters State of Queretaro. Batan, hacienda (113 m.). Queretaro, city (118 m.).

ROUTE 67

MORELIA-CELAYA, about 103 miles

Direction NNE. The road runs near the railway all the way (see Appendix III, Sections xii and xi); distance by rail, 99 m. Route 66 is followed as far as Acambaro (about 60 m.). Here the present route turns NNW. and descends by steep grades to Salvatierra, city (80 m.), alt. 4,750 ft., that of Arambaro being 6,069 ft. At Salvatierra road intersects Route 65, and continues N. to Celaya, city (103 m.), where it links up with Route 28.

ROUTE 68

CELAYA-JARAL (Guanajuato), 31 miles

Direction SW. For railway communication via Salamanca see Appendix III, Section vi; distance by rail, 46 m. There is a carriage road on which diligences run daily, taking $4\frac{1}{2}$ hrs. from Celaya to Jaral, but apparently only $3\frac{1}{2}$ hrs. on the return journey, the time being gained between Jaral and Cortazar. Distances from Celaya city: Cortazar (12 m.), Jaral, village (31 m.).

ROUTE 69

QUERETARO-MEXICO CITY

Direction SE. This is a continuation of Route 28. Two railway lines connect the cities of Queretaro and Mexico by Appendix III, Section vi, distance 153 m.; by Appendix III, Section vii, distance 168 m. Two routes are available :

(A) The old highway to Mexico. On leaving Queretaro there is a steep ascent to Cuesta China (3 m.), then the road passes through Noria Vieja (7 m.). Colorado, hacienda (10 m.). Palo Alto, hacienda (12 m.). La Palma, town ? (17 m.). Arroyoseco, village (19 m.). Sauz (21 m.). Crucitas (23 m.). Trojes Mojas (25 m.). San Juan del Rio, city (31 m.). Road enters State of Mexico. Polotitlan or Soledad, town (47 m.). Encinillas (55 m.). Arroyozarco, hacienda (58 m.). San Miguel, village (62 m.). Sabino (67 m.). San Francisco Soyaniquilpan, village (70 m.). Divisadero (73 m.). La Cañada, hacienda (78 m.). Road crosses a small strip of territory of the State of Hidalgo, passes through the village of Tepeji del Rio (86 m.), and re-enters the State of Mexico. San Miguel Jagüeyes, village (94 m.). Tetla, hacienda (102 m.). Cuautitlan, town (107 m.). A road goes off to Tula, 31 m. distant. La Lecheria, hacienda (111 m.). San Pedro Barrientos, village (114 m.). La Blanca, hacienda (115 m.). Puente Colorado (116 m.). Tlalnepantla, town (117 m.). San Bartolo, village (119 m.). Ahuehuate (121 m.). Mexico City (126 m.).

(B) A road, the nature of which is not stated, provides an alternative between Queretaro and La Palma, passing through Hercules, ? village (2 m.). La Cañada, village (5 m.). Corrales (7 m.). La Griega, hacienda (13 m.). Route 71 (B) branches off NE. to Jalpan. Coyotillos (19 m.). Calamanda, hacienda (22 m.). La Palma (25 m.), and thence by Route (A) to Mexico City (134 m.).

ROUTE 70

SAN LUIS POTOSI-QUERETARO

Direction SSE. For railway connexion between the two cities see Appendix III, Section vii ; distance by rail, 159 m. Two roads are available :

(A) *Via Dolores Hidalgo*. Route 60 is followed as far as San Felipe or Ciudad Gonzalez (62 m.), then Route 39 to Queretaro (155 m.).

(B) *Via San Jose Iturbide*. Nature of road not stated. Distances from San Luis Potosi : Pozos, town (7 m.). Pilas (12 m.). Puerta de la Enramada (24 m.). Ojo Caliente del Potosi (27 m.). Santa Maria del Rio, city (31 m.). Villela, hacienda (44 m.). Road enters State of Guanajuato. Saucedo, hacienda (60 m.). Palencia (65 m.). Estancia de Jesus (68 m.). San Luis de la Paz, city (81 m.). Noria de Charcas, hacienda (97 m.). La Escondida (101 m.). San Jose Iturbide or Iturbide, town (106 m.). Road enters State of Queretaro. Jofre, hacienda (117 m.). Santa Rosa, village (130 m.). Road joins Route (A). Queretaro (144 m.).

ROUTE 71

QUERETARO-JALPAN

Direction NE. No railway communication. Two roads appear to be available :

(A) *Via Bernal*. As far as Amoles this route appears to follow the old high road to Tampico: Route 69 (B) is followed to La Cañada, village (5 m.), where present route turns off to Saldarriaga, congregacion (9 m.). Navajas (16 m.). Esperanza, hacienda (17 m.). Puerto Esperanza (25 m.). Ajuchitlan, hacienda (31 m.). A road goes to Cadereyta, 13 m. distant. Puerto de Ajuchitlan (34 m.). Bernal, village (37 m.). Puerto de la Palma (41 m.). Arroyo Yerbabuena (43 m.). San Pablo, hacienda (47 m.). Pie (or foot) de la Loma de Galvan (52 m.). Puerto de Escanela (54 m.). Arroyo del Ronco (57 m.). Higuerillas (61 m.). Extoras, hacienda and

river (71 m.). Rio del Pilon (76 m.). Rancho Viejo (79 m.). Pie de Loma Larga (82 m.). Pie de Cuesta Blanca (84 m.). Puerto del Cielo (87 m.). Puerto de Tejamanil (89 m.). Amoles, village and mine ? (90 m.). The high road appears to go E. to Xilitla and Tampico, see Route 115 ; present route continues NE. to Jalpan, town (116 m.). A track goes to the village of Tancoyol, 26 m. farther.

(B) *Via Toliman*. The relative position of Routes (A) and (B) is somewhat uncertain. The latter appears to follow Route 69 (B) as far as La Griega (13 m.), then to turn NE. to Colon, town (26 m.). Agua Zarca (30 m.). Chiquihuitito (35 m.). Toliman, city (45 m.). Peñamiller, village (66 m.). A road goes to Rio Verde, see Route 117. Amoles (87 m.). where the road joins Route (A). Jalpan (113 m.).

ROUTE 72

SAN JUAN DEL RIO-JALPAN (Queretaro), 109 miles

Direction NNE. No railway communications. Nature, of road not stated. The city of San Juan del Rio is on the high road from Queretaro to Mexico, see Route 69 (A). The present route goes NNE. through Cadereyta, city (22 m.), Sauz (28 m.), and Laguna Seca (35 m.), to Toliman (41 m.), where it joins Route 71 (B), and continues along it to Jalpan (109 m.).

ROUTE 73

QUERETARO-AMEALCO

Direction SSE. No railway communications. Nature of road not stated. It passes through the village of Huimilpan (21 m.) to the town of Amealco (42 m.).

Amealco can also be reached by following the highway, Route 69 (A), to San Juan del Rio (31 m.), and thence to Amealco (49 m.).

ROUTE 74

QUERETARO-TOLUCA (Mexico), 122 miles

Direction SSE. The cities are connected by railway (Appendix III, Sections vi and xi), both via Celaya ; distance 203 m., and via Mexico City, distance 198 m., but the road, the nature of which is not stated, is more direct. Distances from Queretaro : Batan, hacienda (4 m.). Road enters State of Guanajuato. Sabanilla, hacienda (17 m.). Coroneo, village (31 m.). Molinos de Caballero (44 m.). Road enters State of Mexico. Temascalcingo, town (68 m.). Cuajomulco, village (86 m.). Ixtlahuaca, town (99 m.), thence by the high road (Route 51) to the city of Toluca (122 m.).

ROUTE 75

ACAPULCO-MEXICO CITY

Direction N. Mexcala, on the Rio de las Balsas, is connected with the capital by a railway (Appendix III, Section xxii), which it is intended to continue to Acapulco. Several roads or tracks are available.

(A) *Main road.* This road appears to be suitable for wheeled traffic throughout. In 1909 the section between Chilpancingo and Iguala was rebuilt and made into a good motor road, 14 ft. wide, with maximum grade of 4 to 4½ per cent., and substantial bridges across all rivers except the Rio de las Balsas, across which traffic was ferried in a large launch. A similar road existed between Cuernavaca and Mexico City. It was intended to rebuild in the same manner the section from Acapulco to Chilpancingo, and work was begun in 1910, but it is improbable that it was ever completed. The details given below on this section of the route are from H. Gadow's travels in 1904. Distances from Acapulco : Venta Vieja, hacienda (10 m.). Egido Nuevo, hacienda (21 m.). Dos Arroyos, village (35 m.). A somewhat longer road goes from Venta Vieja via La Providencia, hacienda (35 m.). Xaltianguis (47 m.), to Dos Arroyos (62 m.); see

also alternative Route (B). Main road continues through Los Guajes, cuadrilla (40 m.). El Alto (43 m.). Agua del Perro, cuadrilla (48 m.). Venta del Peregrino (52 m.). Cumbre del Peregrino (55 m.). Venta del Paso Real del Papagayo (60 m.). Palo Gordo (65 m.). Tierra Colorada, hacienda (67 m.). Dos Caminos, cuadrilla (75 m.). A road from Ayutla comes in on the SE., see Route 76 (B). Beyond Dos Caminos there is a steady rise; in the worst and steepest places the road was originally paved, but the stones have been loosened by tree-roots which, hidden in mud, are dangerous to horses and mules. A stretch of flat country is soon followed by a steep rise of 1,000 ft. in 3 m. through Rincon (82 m.), to the pass of the Cajones or Cumbre del Cerro de los Cajones (84 m.); road at first poor, but across the pass there is a well-constructed winding road. Farther on the road again becomes a mere track across very undulating country. Acahuitzola, hacienda (92 m.). La Imagen, hacienda (94 m.). Beyond a steep rise road reaches Palo Blanco (97 m.), a very dirty hacienda, and Mazatlan (99 m.), another dirty and straggling hacienda amid maize fields and meadows. Thence road rises through a gorge to Petaquillas, village (104 m.), and Chilpancingo, city (109 m.). From Chilpancingo (alt. 4,527 ft.) road rises 400 ft. in 3 m. to a pass, then descends steadily over calcareous sparsely-wooded land to the village of Zumpango del Rio (117 m.). Venta del Zopilote (127 m.), where road enters a narrow cañon, difficult to pass in the rainy season.¹ Mexcala or Balsas (150 m.), a village at the N. end of the cañon, where the latter opens into the Rio de las Balsas. River crossed by a large government ferry capable of holding 6 horses. Xalitla, cuadrilla (158 m.), on opposite bank, alt. about 1,500 ft. From the valley of the Balsas road steadily rises through the cuadrillas of Tonalapa (169 m.), Sabana Grande (174 m.), Sacacoyuca (181 m.), and Tepochica (184 m.). In this neighbourhood the road reaches

¹ The itinerary followed for this section is dated 1892; it is possible that the new road takes a slightly different course, perhaps over the plateau of Xochipala.

an altitude of nearly 4,000 ft., and then descends steeply to the city of Iguala (189 m.). Beyond Iguala the road passes through Platanillo, hacienda (199 m.). Los Amates, cuadrilla (205 m.). Venta de la Negra, cuadrilla (210 m.). La Cajita (215 m.). Tepetlapa, cuadrilla (217 m.). Road enters State of Morelos. Amacuzac, village (225 m.). San Gabriel, hacienda (227 m.). Puente de Ixtla, village (228 m.). A good road goes to Tetecala, distant 13 m. N. Alpuyeca, village (241 m.). Xochitepec, town (245 m.). El Puente, hacienda (246 m.). Acatlipa, village ? (250 m.). Temisco, hacienda (251 m.). Cuernavaca, city (256 m.). Huitzilac, village (267 m.). Cruz del Marques (274 m.). Road enters Federal District. El Guarda (279 m.). Topilejo, village (288 m.). San Mateo, village (290 m.). Tepepam, village (295 m.). Mexico City (308 m.).

From Cuernavaca a horse-track goes N. to the city of Tlalpam (43 m. distant); the ride usually takes about 12 hrs. A carriage-road connects Tlalpam with Mexico City.

(B) *Across the Sierra*. This road provides an alternative between Acapulco and Chilpancingo. It leaves main road at Venta Vieja (10 m.), and turns due N. via Texca, village (25 m.). La Providencia, hacienda (35 m.). From here a road joins main road at Dos Arroyos. Cruz del Cerro de San Nicolas (47 m.). Cerro de la Calera (56 m.). Santa Rosa, cuadrilla (60 m.). Ceutla (68 m.). Rio de San Cristobal (68½ m.). Santa Barbara, cuadrilla (75 m.). Santa Rita, cuadrilla (89 m.). Cumbre de Minas Viejas (94 m.). Carrizal, cuadrilla (101 m.). Pueblito (101½ m.). Naranjo, cuadrilla (104 m.). Rincon de Alcaparrosa (114 m.). San Vicente, hacienda (124 m.). Huacalapa (134 m.). Tepoxtepec, cuadrilla (149 m.). Cumbre del Cerro de La Escalera (150 m.). Apetlanca, hacienda (151 m.). Chilpancingo (161 m.). Thence by main road (Route A) to Mexico City (360 m.).

(C) *Via Coquillo and Quechultenango*. This road provides another alternative between Acapulco and Chilpancingo. It leaves the main road at Dos Arroyos (35 m.), and continues via Alto del Camaron (46 m.). Pozuelos (48 m.). Vado (ford)

del Rio Papagayo (57 m.). Coquillo (60 m.). Road crosses Route 76 (B). Carrizo (67 m.). Chautipan (80 m.). Terrero (79 m.). Nacastlan (92 m.). Before entering the last-named rancho the road crosses Rio Omitlan. Pueblo Viejo (97 m.). Campanario (100 m.). Jalapa (114 m.). Quechultenango, village (124 m.). San Miguel (130 m.). Mochitlan (133 m.). Tepatitlan or Tepantitlan ? (136 m.). Petaquillas, village (138 m.). Here the main road is rejoined and followed to Chilpancingo (143 m.) and Mexico City (342 m.).

(D) *Via Taxco*. This road provides an alternative between Iguala and Amacuzac. On leaving main road at Iguala (189 m.) it winds NW. over undulating ground, passes through the village of Tecapulco (204 m.) to the city of Taxco (211 m.). In 1909 a new road, 14 ft. wide, with good surface, was under construction between Naranjo, a railway station just N. of Iguala and Taxco. There is no information on the condition of the road beyond Taxco. Distances : Acamixtla, village (214 m.). Acuitlapan, village (219 m.). Achichintla, cuadrilla (221 m.). Road enters the State of Morelos. Huajintlam, village (233 m.). Amacuzac, village (236 m.). Route rejoins main road to Mexico City (319 m.).

(E) *Via Coyuquilla and Toluca*. As far as Toluca nature of the road not stated. Direction WNW. to Coyuquilla, then mainly N. and NNE. Except between San Juan and Mexico City (Appendix III, Section xi) there are no railway communications. Distances from Acapulco : Pie de la Cuesta (10 m.). Boca de Coyuca (25 m.). Boca de Mita (34 m.). Pozuelos (38 m.). Al Real (52 m.). San Jeronimo, village (59 m.). Tecpan, city (77 m.). Nusco, hacienda (90 m.). San Luis, hacienda (108 m.). Coyuquilla, hacienda (126 m.). A road continues WNW. along the littoral to Zacatula ; see Route 81. Present route turns N. and enters the Sierra. Dolores, hacienda (202 m.). Queseria, cuadrilla (266 m.). Coyuca de Catalan, city (274 m.). Road crosses Rio de las Balsas, enters State of Michoacan and intersects Route 83 (A). Pungarabato, village (277 m.). Road re-enters State of Guerrero. Cutzamala, village (291 m.). Some miles farther

N. road enters State of Mexico. Tejupilco, town (393 m.). San Simon (393½ m.). Puerto de los Tepetates (396 m.). Barranca de Agua Puerca (400 m.). Teneria, hacienda (401 m.). Rio de Cuernavaca (403 m.). Rio de Chilero (404 m.). Trancas (406 m.). Estancia, hacienda (406½ m.). Mina de Agua (407½ m.). Temascaltepec, town (409 m.). Carbonera (412 m.). Cieneguillas, hacienda (417 m.). Albarranes, hacienda (419 m.). Comunidad (420 m.). San Miguel (421 m.). Meson Viejo (425 m.). Cruz Carraton (427 m.). Puerto de las Cruces (428 m.). San Juan, village (436 m.). Huertas, hacienda (437 m.). San Antonio, village (439 m.). Pila, hacienda (440 m.). San Buenaventura, village (440½ m.). Toluca, city (444 m.). Thence by Route 51 to Mexico City (484 m.).

ROUTE 76

PUERTO DE PALIZADA (? NEXPA)—CHILPANCINGO (Guerrero)

Direction NNW. No railway communication. Two routes are available :

(A) *Via Quechultenango*. Although the route starts from Pacific coast, access from the sea is said to be practically impossible. The country near the shore consists mainly of slightly undulating gritty ground, with low ridges separated by impenetrable swampy groves. The road is a poor track through a wild mountainous district, and certain sections are impassable during the rainy season. Distances from Puerto de Palizada (? Nexpa) : Apozahualco (5 m.). Soledad, hacienda (9 m.). Jalapa, hacienda (12 m.). Cruz Grande (19 m.). Steep ascent through Ometepe (24 m.) to Ayutla (27 m.), a city in level country. A track goes off W. ; see Route (B) below. Another track goes SE. to Copala, village. Present route continues via Pantla (35 m.). La Brea (40 m.). Parota (43 m.). Aguacate (52 m.). Nancintla, village (56 m.). Teocintla, village (59 m.). Jojutla (63 m.). Colotlipa, village (69 m.). Quechultenango, village (81 m.). From here Route 75 (C) is followed to Chilpancingo (100 m.).

(B) *Via Coquillo*. At the city of Ayutla (27 m.) this route

follows a track going in a westerly direction across level country to the village of ? Texonapam ; road rises to Limon, cuadrilla, and continues through undulating country, passing over ridges of loess and sand (alt. about 2,000 ft.), then descends to Pochote, a cuadrilla on a fine stream of clear water. Road descends the valley of the Chacalapa, a tributary of the Rio Papagayo. Beyond the village of Chacalapa the river, which is clear and shallow, is crossed. Coquillo. Road crosses Route 75 (C). Road turns NW. and ascends a ridge more than 1,000 ft. above the valley. On the opposite side road descends, taking a zigzag course down a densely wooded slope and passing through Tepehuaje and Omitlan, cuadrilla (about 57 m.), into the deep narrow valley of Rio Papagayo (alt. about 520 ft.). The river, which has a large volume of water, is forded at Paso de Omitlan. Road rises to Tierra Colorada, a large straggling village (alt. about 1,000 ft.). Road passes over slightly undulating country of red soil, into which deep narrow tracks have been worn by traffic. At times the tracks are so narrow that mules cannot pass with a full pack and have to be unloaded. At Dos Caminos (about 77 m.) the track joins main road from Acapulco, Route 75 (A), and follows it to Chilpancingo (about 111 m.).¹

ROUTE 77

OMETEPEC-CHILPANCINGO (Guerrero), 140 miles

Direction NW. No railway communication. Only a track. Distances from Ometepepec, a town near the Pacific coast : Coatepec, village (36 m.). Ayutla, city (67 m.). From this point Route 76 (A) is followed to Chilpancingo (140 m.).

ROUTE 78

OMETEPEC-ACAPULCO (Guerrero), 198 miles

Direction WNW. No railway communication. Nature of road not stated, probably only a horse-track, running almost parallel with the Pacific coast. Distances from Ometepepec,

¹ Distances between Ayutla and Dos Caminos are only approximate.

town: Rio de Quetzala (10 m.). Juchitan por los Altos (21 m.). Juchitan por los Bajos (30 m.). Zoyatlan, village (41 m.). Copala, village (51 m.). A track goes NW. to Ayutla, linking up with Route 76 (A). Cuautepec, village (64 m.). Cruz Grande (80 m.). Caridad (98 m.). San Marcos, village (111 m.). Potrero (126 m.). Tecoanapa, village (147 m.). Santa Maria de la Palma (178 m.). Posquelite (183 m.). Acapulco, city (198 m.).

ROUTE 79

ZACATULA (Guerrero)—MORELIA, 238 miles

Direction NNE. No railway communication. This route connects Zacatula, a cuadrilla near the Pacific coast, with Morelia and the railway to Mexico City. As far as Patzcuaro it is only a horse-track. The journey from Ario to Zacatula is said to be a four days' ride on horseback. From Zacatula, near the mouth of the Rio de las Balsas, route follows up the r. bank, then turns N. and enters the State of Michoacan. Tumbiscatio, village (52 m.). Sirahua ? (107 m.). Cayaco, ? hacienda (130 m.). La Huacana, village (137 m.). Ario, town (168 m.). A track goes SE. to Tacambaro, linking up with Route 54 (A). Santa Clara, town (189 m.). Patzcuaro, city (199 m.). Thence by Route 52 (A) to Morelia, city (238 m.).

ROUTE 80

SIHUATANEJO (Guerrero)—MORELIA, 337 miles

Direction N. No railway communication. This route connects Puerto Sihuatanajo on the Pacific coast with Morelia and the railway to Mexico City. As far as Patzcuaro it is only a horse-track. Distances from Sihuatanajo: Ixtapa (10 m.). Laja (30 m.). Vallecitos, hacienda (43 m.). Guadalupe, mine ? (55 m.). Fayran (65 m.). Valle, cuadrilla (99 m.). Animas, cuadrilla (135 m.). Potrero, hacienda (140 m.). Soyatan, cuadrilla (150 m.). Zapote, cuadrilla (152 m.). Soria (154 m.). Road enters State of Michoacan. Lamatepec (162 m.). Parotas (173 m.). Potrero (180 m.).

Jazmin (189 m.). Cutio (196 m.). Ahuijote or ? Ahuizote (203 m.). Casitas (211 m.). Oropeo, ? hacienda (216 m.). Cayaco, ? hacienda (229 m.). Thence by Route 79 to Morelia, city (337 m.).

ROUTE 81

ACAPULCO-ZACATULA (Guerrero), 250 miles

Direction WNW. No railway communication. This track runs parallel with the Pacific coast. From Acapulco route follows Route 75 (E) as far as Coyuquilla (126 m.), then continues WNW. through Toluca (144 m.), Petatlan, village (155 m.), San Jeronimito, hacienda (165 m.), Coacoyul, hacienda (185 m.), Lagunillas (201 m.), Temalhuacan, hacienda (211 m.), Chutla, village (216 m.), Union or La Union, village (224 m.), Tamarindo, cuadrilla (232 m.), to Zacatula, cuadrilla (250 m.).

ROUTE 82

CHILPANCINGO (Guerrero)-SILACAYOAPAN (Oaxaca), about 85 miles

Direction E. No railway communication. A horse-track through mountainous country. Chilpancingo to Tlapa is considered a two days' ride. From Chilpancingo to Tixtla, city ($7\frac{1}{2}$ m.)¹ road rises more than 1,000 ft. A track goes to Chilapa, a city about 25 m. distant through which there appears to be another route to Tlapa. Nanzintla, village (21 m.). Cuistlahuaca (26 m.). Chapitzaco (36 m.). Tlapa or Ciudad Comonfort (43 m.). No details available beyond Tlapa. The track enters State of Oaxaca (about 55m.). Silacayoapan, town (about 85 m.). Here track links up with Route 88.

ROUTE 83

IGUALA (Guerrero)-HUETAMO (Michoacan)

Direction W. This route connects the NW. corner of the State of Guerrero with the railway station of Iguala (Appendix III, Section xxii). Two roads are available.

¹ According to another estimate the distance to Tixtla is 10 m.

(A) *Via Coatepec*. According to information dated 1910 the road as far as Tetoloapan is used to some extent for wheeled traffic, but it is difficult and in certain parts dangerous even for horses. Beyond Tetoloapan it appears to become a rough horse-track. Distances from the city of Iguala: Metlapa, cuadrilla (5 m.). Ahuehuepan, cuadrilla (11 m.). Tonalapa, cuadrilla (14 m.). Coatepec, village (15 m.). Teloloapan, city (35 m.). Zimatepec (40 m.). Amahuatepec (62 m.). Ajuchitlan, town (84 m.). Coyuca de Catalan, city (100 m.). Here road enters the State of Michoacan and crosses Route 75 (E). Zirandaro, village (113 m.). Huetamo, town (137 m.). For continuation to Morelia see Route 54.

(B) *Via Taxco*. This route is considerably longer, but the road as far as Taxco (22 m.) is in good condition and has been described under Route 75 (D). Beyond Taxco it is probably only a horse-track. It passes through Cacalotenango, village (29 m.), Cuesta de San Felipe (34 m.), Ixcateopan, village (51 m.), to Teloloapan, city (68 m.), where it joins Route (A) and continues along it to Huetamo (170 m.).

ROUTE 84

CUERNAVACA (Morelos)—TOLUCA (Mexico), 50 miles

Direction NW. Cuernavaca and Toluca are connected by railway via Mexico City (see Appendix III, Sections xxii and xi), distance by rail 119 m. The nature of the road varies considerably; in the Sierra it is only a horse-track. On leaving Cuernavaca the high road to Mexico City, Route 75 (A), is followed as far as Huitzilac, village (11 m.). Beyond the village the route lies along a horse-track through a very mountainous district, and enters the State of Mexico. Capulin (18 m.). Santiago, village (37 m.). Beyond this point the road is again fit for wheeled traffic and passes through Atenco, hacienda (39 m.) to Toluca, city (50 m.). For continuation to Mexico City see Route 51.

ROUTE 85

CUAUTLA (Morelos)—MEXICO CITY

Direction NNW. The cities are connected by railway (Appendix III, Sections xix and xvi). Distance by rail 82 m. Two roads are available.

(A) *Via Chalco*. Nature of road not stated; although described as a *camino comune* it is probably, at all events in Morelos, little more than a horse-track. On leaving the city of Cuautla the road passes through Tetelcingo, village (8 m.). Calavera (14 m.). Road enters State of Mexico. Atlapango, hacienda (19 m.). Xuchi or ? Xuchitepec, town (25 m.). Tenango del Aire, village (30 m.). Chalco, town (38 m.). Ayotla, village (45 m.). Reyes, village (50 m.). Road enters Federal District. Peñon Viejo, hacienda (53 m.). Mexico City (61 m.).

(B) *Via Cuernavaca*. The road appears to be fit for wheeled traffic; in the neighbourhood of Cuautla it is used (according to evidence dated 1909) by hundreds of two-wheeled carts pulled by four mules abreast. It passes through large cane-fields. Yautepec, styled a city but only a village (4 hours' ride or about 12 m.). Road rises through groves of palm-trees, crosses a low range, descends into a valley with a stream of clear water, 1 m. beyond it enters the Indian village of Tejalpa, then passes over a bed of lava (or *pedregal*); surface of road very rough. At Atlacomulco, hacienda, road again passes through sugar plantations and maize-fields to Cuernavaca, city (about 25 m.). Thence by Route 75 (A) to Mexico City (about 77 m.).

ROUTE 86

PUERTO ANGEL (Oaxaca)—MEXICO CITY, 425 miles

Direction NNW. There are no railway communications between Puerto Angel, on the Pacific coast, and Ejutla. Beyond Ejutla the railway appears to run at a short distance of the road most of the way to Mexico City (see Appendix III, Section xxvii), especially between Tehuacan and Puebla.

The road is suitable for wheeled traffic. A track from Escondido joins the main road some miles beyond Puerto Angel. The section from the coast to Oaxaca City was recently rebuilt and provided with strong bridges and good drains ; the width varies from 18 to 36 ft., and, according to a report dated 1913, the surface is good. Route 87 provides an alternative between Oaxaca and Puebla, but along an inferior (?) road. Distances from Puerto Angel, a small hamlet : Pochutla, town (8 m.). Rio de Chacalapa (16 m.). Totoltepec or ? Toltepec (22 m.). Soledad, coffee plantation (27 m.). Providencia, coffee plantation (30 m.). Garganta or gorge in Cerro de la Pluma (35 m.). Porvenir, coffee plantation (39 m.). Rio Capalita. San Pedro el Alto, village (48 m.). Rio de San Jose (51 m.). Suchiltepec or San Miguel Suchiltepec, village (53 m.). Cañas (55 m.). Tres Cruces (58 m.). Garganta or gorge of Ercino (61 m.). San Jose del Pacifico, village (62 m.). Agua del Sol (70 m.). Cerro Chapaneco (75 m.). Miahuatlan, city (83 m.). Tepehuaje (87 m.). Soledad (90 m.). Tlacuache (92 m.). Zopilote (95 m.). Chichobo (99 m.). Arrogante (102 m.). Coatequitas (104 m.). Ejutla, city (106 m.). San Miguel Ejutla, village (108 m.). Rio de Cuapa (110 m.). San Martin de los Cansecos, village (114 m.). Magdalena, village (118 m.). Ocotlan de Morelos, town (124 m.). Chilateca or San Juan Chilateca, village (127 m.). Jalieza or Santo Tomas Jalieza, village (129 m.). Cuesta de la Cruz. Coyotepec, village (137 m.). Oaxaca, city (145 m.). Garita del Marquesado (146 m.). Panzacola, hacienda (148 m.). Blanca, ? hacienda (152 m.). San Sebastian, village (154 m.). Dolores, hacienda (156 m.). Etna, town (157 m.). Rio de la Asuncion (157½ m.). Cataneo, ? hacienda (159 m.). Rio de Magdalena (159½ m.). Etna Santo Domingo, village (161 m.). Santiago (163 m.). Huitzo San Pablo, village (165 m.). Huitzo San Francisco (168 m.). Paraje de Tierra Blanca (172 m.). Carbonera (176 m.). Trancas (178 m.). Boca de Leon (180 m.). Paraje de Cieneguilla (183 m.). Cañada del Capulin (189 m.). Paraje de Venta Vieja (191 m.). La Joya, bridge (192 m.). Paraje de Buenavista (194 m.).

Puente de Nopala (199 m.). Dondominguillo or Dominguillo, (201 m.). Road descends broadening fertile valley. Chilar (207 m.). Road passes over a ridge and continues along undulating country, crossing several streams, e.g. Rio de Tomellin (209 m.) and Rio de Apoala (210 m.). Güendulain, hacienda (210½ m.). Obos (213 m.). Road runs near river bank through well irrigated fields; some sections liable to be very muddy. Trapiche or sugar-mill de los Obos (215 m.). Cuahulotal (215½ m.). Urrutia (217 m.). Road enters wild mountainous country. Paraje de Chonoslas (218 m.). Rio Seco (219 m.), a dry river-bed. Paraje Blanco (220 m.). Paraje del Arenal (223 m.). Road more level on entering Valley of Rio Salado (226 m.); the river is liable to freshets and not always fordable; the road continues up the valley. Tecomavaca, village (228 m.), railway station a long distance to W. of village. Los Cues or San Juan de los Cues, village (236 m.). Mountains recede on both sides; road enters wide plain. Ayotla, hacienda (239 m.). Nanahuatipan or San Antonio Nanahuatipan, village (244 m.). In this neighbourhood road appears to enter the State of Puebla. Tilapa, hacienda (247 m.). Fine sugar plantations. Road passes over sandy hills and irrigated fields. Calavera (250 m.). Dolores (254 m.). Venta Salada (255 m.). Rio Salado forded a second time. San Sebastian, village (262 m.). Pantzingo (266 m.). Tehuacan, city (275 m.). A road leads N. to Acultzingo and Orizaba; see Route 127. Present route proceeds via San Lorenzo, village (278 m.). Cruz Grande de Tepango (283 m.). Tepango, village (288 m.). Cacaloapan, village (290 m.). Tlacotepec, village (293 m.). Castañeda (301 m.). Animas, hacienda (306 m.). San Isidro, hacienda (310 m.). Tecamachalco, city (314 m.). Santa Catarina Cuapixtla, village (321 m.). San Hipolito, village (325 m.). Tepeaca, city (328 m.). Country again more mountainous. Venta de Tejas (329 m.). Venta de Santa Rosa (335 m.). Barranca del Capulin (337 m.). Amozoc, town (339 m.). Thence by the old highway, Route 125 (A), to Mexico City (425 m.).

ROUTE 87

OAXACA-PUEBLA

Direction NNW. Distance by railway 228 m., see Appendix III, Section xxvii. There are two routes :

(A) *Via Tehuacan.* This follows all the way the main road described under Route 86. Total distance by this route 204 miles.

(B) *Via Acatlan.* This road dates from the time of the Aztecs, and, according to information of 1913, is kept in good condition, although since the opening of the Mexican Southern Railway (Appendix III, Section xxvii) traffic has considerably diminished. In certain sections, however, the road appears to be very narrow. It follows the railway as far as Las Sedas, and at Ahuatempan or Mucio Martinez it links up with the present terminus of the Rosendo Marquez branch line (Appendix III, Section xxiii). There is a diligence service between Acatlan and the station of Ahuatempan. On leaving Oaxaca Route 86 is followed as far as Huitzo San Pablo (20 m.). At this village present route turns off WNW. up a deep narrow gorge and after a steep ascent reaches the watershed at Las Sedas, village (28 m.). Beyond the village a narrow track goes down another gorge, with wooded slopes, to El Parian station and thence W. by a good winding road. The present route appears to follow a better track going from Las Sedas in a westerly direction through Huaclilla, village (54 m.), and Adeques San Miguel, village (67 m.), where it meets the carriage road from El Parian station and continues along it W. to Quilitongo, village (68 m.), and Nochixtlan, town (72 m.). From here a road goes N. to the town of Coixtlahuaca, 13 m. distant, and another to Tlaxiaco; see Route 88 (A). The country beyond Nochixtlan is much cut up by gorges. Present route descends into a broad valley. Tillo Santiago, village (77 m.) Tiltepec, village (80 m.). Teposcolula, town (95 m.). From here a good (?) road continues W. to Tlaxiaco; see Route 88 (B). Present route goes NW. to Lagunas, village (100 m.). Tama-

zulapan, town (108 m.). Tutla Santa Maria, village (113 m.). Matanza (126 m.). Cacalotepec, village (129 m.). Huajuapán, city (134 m.). No details available beyond Huajuapán, distances only approximate. Road appears to enter State of Puebla (about 150 m.). Acatlán, city (about 170 m.). Ahuatempan or Mucio Martínez, village (about 190 m.). Thence along the railway to Puebla (272 m.).

ROUTE 88

OAXACA-SILCAYOAPAN

Direction WNW. No railway communication. Two roads are available.

(A) *Via Juxtlahuaca*. The road is said to be good as far as Tlaxiaco. Route 87 (B) is followed to Nochixtlan (72 m.), thence WSW. through Yodocono, village (82 m.). San Juan, village (92 m.). Tayata, village (102 m.). Tlaxiaco city (110 m.). Mixtepec, village (127 m.). Tejocote (131 m.). Mesones, village (134 m.). Juxtlahuaca or Villa Albino Zertuche, town (141 m.). Sabinera (146 m.). Santiago del Rio, village (154 m.). San Mateo del Rio, village (155 m.). Silcayoapan, town (162 m.). For continuation to Chilpancingo (Guerrero) see Route 82.

(B) *Via Teposcolula*. Route 87 (B) is followed as far as Teposcolula (95 m.), thence by a good road WSW. through bare country. Tixa, village (98 m.). Yolomecatl, town (106 m.). Huamelulpan, village (108 m.). Country becomes wooded. Tlaxiaco, city (119 m.). Here the road rejoins Route (A) and follows it to Silcayoapan (171 m.).

ROUTE 89

SALINA CRUZ-OAXACA, 194 miles

Direction NW. This route connects the post of Salina Cruz, the terminus on the Pacific coast of the Tehuantepec National Railway, with Oaxaca. Distance by railway via Córdoba and Esperanza 540 m.; see Appendix III, Sections xxx, xxv, xxvi, xxiii and xxvii. The road is fairly good

except in the mountainous parts, where it is often very narrow. In most sections there are no bridges. A tramway runs on the road from Oaxaca to Santa Maria del Tule and it is intended to continue it to Tlacolula and Mitla. By relays couriers cover the distance from Oaxaca to Tehuantepec in 48 hrs. ; a single rider requires 5 or 6 days. From Salina Cruz there appears to be a fair road to Tehuantepec, city (12 m.). A road covered with deep white sand connects Tehuantepec with San Mateo del Mar, a village 12 m. away, on a lagoon near the coast. This road is used by ox-carts, but the country is liable to be flooded. From Tehuantepec the present route goes W.(?), crosses the Rio Tehuantepec (no bridge except railway bridge at lower end of city) and passes through a well cultivated plain (sugar, cotton, bananas), to Mixtequilla, village (14 m.) ; the road, uneven and loamy, is used considerably by two-wheeled ox-carts. From Mixtequilla it follows a depression, occasionally swampy, between the low coast range and the next series of hills, to Tequisistlan (48 m.), a village on rising ground. A longer route is often followed by ox-carts along the bank or even up the sandy bed of the Rio Tehuantepec, via Jalapa village, joining the main route at Tequisistlan. In the rainy season both routes are said to be impracticable. On leaving Tequisistlan the road descends to the rocky bank of the Rio Tequisistlan, a small tributary of Rio Tehuantepec. After crossing the river the road, now broad, sandy, and level, turns up the valley which gradually narrows to a deep gorge at Las Vacas (66 m.). Road leads over rather bare mountainous country ; with the exception of Rio Hondo, just beyond Las Vacas, all the rivers run dry, and it is difficult to obtain water in the dry season. Yautepec San Bartolo (96 m.), a large village on high bank of a river. Steep rise through Manteca (105 m.) to San Carlos (108 m.). Road, stony and difficult, follows up a deep gorge, and at times coincides with the bed of the river ; country bare and dry ; few signs of cultivation. Quemado (121 m.). Undulating road ascends through pine and oak forests ; Escondido or Agua Escondida (124 m.).

Steep descent to Vichones or Pichones ? (131 m.). Road emerges from the forests and continues down the bank of a torrent, passing between bare greyish hills, to Guegollecche San Juan or Rancho San Juanico ? (139 m.). Road follows up the bed of Rio Tehuantepec, here also called Rio Totolapa, to the village of Totolapa or Totolapam (142 m.), a relay station at the junction of Rio Seco and Rio Tehuantepec. Road, fairly level, continues partly along the bank, partly in the bed of Rio Seco. Cascajal (149 m.), a few poor huts. Road leaves the river, winds up the steep slope of a ridge, and enters a very narrow valley. The road follows the side of the valley. It is partly cut out of the rock, partly resting on wooden piles and hurdles, and barely wide enough for a cart. From Rosario, hacienda, on Rio Tehuantepec, there is a steep rise out of the valley to San Dionisio (156 m.), an Indian village. The road, at first stony, improves further on; it passes through gorges and round hillocks; after rain it becomes impracticable for carts. Matatlan, an Indian village. Road lined with bushes continues through broken country to Tlacolula, city (173 m.). From here a good road goes E. to Mitla, a large village 8 m. away. For the rest of the journey there is a good cart-road through Tlacochahuaya, village (182 m.), Santa Maria del Tule, village (187 m.), San Sebastian (189 m.), Santa Cruz (190 m.), Santa Lucia del Camino, village (192 m.), to Oaxaca, city (194 m.).

ROUTE 90

OMETEPEC (Guerreo)—OAXACA, about 274 miles

Direction NE. No railway communication. According to information dated 1913 the road is good, especially beyond Juquila. At Ometepec, a town near the Pacific coast, present route links up with Routes 77 and 78. As far as Pinotepa Nacional no details are available and the distance can only be approximately estimated. Shortly after leaving Ometepec road enters State of Oaxaca and goes E. to Pinotepa Nacional, town (about 30 m.). Huazolotitlan, town (46 m.). Jamil-

tepec, town (54 m.). Soledad (64 m.). Huichicata (72 m.). Zanate (80 m.). Road crosses Rio Verde (93 m.). Tepenixtlahuaca, village (108 m.). Panixtlahuaca, village (129 m.). Juquila, town (145 m.). Yolotepec, village (155 m.). Juchatengo, village (168 m.). Santa Ana, sugar mill (183 m.). Lazo, sugar mill (193 m.). Sola Santos Reyes or Los Reyes Sola, village (210 m.). San Miguel Peras, town (212 m.). La Y (233 m.). San Andres Zavache, ? village (244 m.). Nixila Santa Cruz, village (247 m.). Ayoquesco, town (248 m.). Tlapacoyan Santa Ana, town (252 m.). Valdeflores, hacienda (255 m.). Santa Gertrudis, hacienda (256 m.). Huixtepec San Pablo, town (257 m.). Zimatlan or Villa Alvarez, town (262 m.). Cienega or ? swamp of Zimatlan (266 m.). Zaachila La Trinidad, village (267 m.). Zaachila, town (268 m.). Xoxocotlan, village (270 m.). Oaxaca, city (274 m.).

ROUTE 91

OAXACA-CHOAPAN, 114 miles

Direction ENE. No railway communications. The roads in this district are very narrow, rough, and much neglected. According to information dated 1913 the attempt to rebuild the road as far as Villa Alta has been abandoned; some sections, however, were slightly improved and a bridge across Rio Yalaga was completed. Distances from Oaxaca: Tlalixtac, town (5 m.). Cuajimoloyas (26 m.). Cajonos San Miguel, village (49 m.). Cajonos San Pedro, village (52 m.). Cajonos San Francisco, village (55 m.). Yalaiag, ? town (62 m.). Villa Alta, town (76 m.). Betaza, village (86 m.). Totontepec, village (96 m.). Amatepec, village (99 m.). Chinantequilla (104 m.). Comaltepec San Juan, village (112 m.). Choapam, town (114 m.).

ROUTE 92

OAXACA-TUXTEPEC, 161 miles

Direction NNE. There is no direct railway connexion. As far as Xia the cart-road leading to Ixtlan or Villa de

Juarez is followed. In 1909 it was reported to be in fair condition, but the nature of the road beyond Xia was not stated. Rivers have to be forded, but in time of floods light suspension-bridges (*puentes colgantes*) are usually constructed by the natives. Tuxtepec is situated on Rio Papaloapan, a navigable river on which several private companies maintain small steamers. Distances from Oaxaca: Santa Lucia, village (2½ m.). San Agustin de las Juntas, village (5 m.). Molinos de Montecon (10 m.). La Parada (23 m.). Xia factory (31 m.). The main road continues to Ixtlan or Villa de Juarez 8 m. away. Present route follows a track through Baratillo (39 m.). Analco, village (44 m.). Atepec, village (47 m.). Luvina, village (57 m.). Macuiltianguis, village (60 m.). Comaltepec, village (65 m.). Yolox, village (70 m.). Barrio (73 m.). Cuasimulco (96 m.). Yetla, village (122 m.). Valle Nacional, village (125 m.). Jacatepec, village (138 m.). Chiltepec, village (148 m.). San Antonio (158 m.). Tuxtepec, town (161 m.).

ROUTE 93

TONALA-TUXTLA GUTIERREZ (Chiapas)

Direction NE. No railway communications. Two routes are available.

(A) *Via Calera*. This road, known as the 'old road', is said to be shorter, but generally in bad condition. There is a very steep climb over the Sierra de Macuilapa, so wind-swept that traffic is often suspended for several days. Distances from Tonalá: Rosario (12½ m.). Calera (15 m.). San Joaquin (17 m.). Rancho de Canias? (22 m.). Cumbre or summit of Sierra de Macuilapa (30 m.). Buenavista (35 m.). Catarina, hacienda (40 m.). Jesus (53 m.). Libertad, village (60 m.). Santa Lucia, hacienda (65 m.). Rejeguera (70 m.). Hoja Blanca (75 m.). Santo Tomas (80 m.). Cumbre del Desengaño (83 m.). Valle de los Corzos (85 m.). Paraiso (90 m.). Canelar (93 m.). Pictutal (105 m.). Ovejeria (113 m.). Tuxtla Gutierrez, city (124 m.).

(B) *Via Jalisco*. This route is said to be longer, as it makes

a detour to W., but the road is wide, has no very steep grades, and crosses the Sierra at a comparatively low altitude. It was constructed about 1895, but, according to information dated 1909, it has been much neglected, the surface being much cut up by the constant passage of heavy ox-carts; during 1910, however, the section from Petapa to Tuxtla Gutierrez was partially rebuilt. Distances only approximate. On leaving the city of Tonalá route turns NW. to Jalisco, ? village (about 17 m.), and Marias, hacienda (about 34 m.). The road, sandy and fairly level up to this point, now rises along Cuesta Fernando, a bleak mountain slope. San Miguel (50 m.) on the other side of the pass. In this neighbourhood the road appears to cross Route 95; it follows the bank of Rio de Zintalapa, crossing the river about four times. Razon, hacienda (64 m.). Zintalapa (71 m.), a large village about 1 m. off the main road. Jiquipilas, village (78 m.). Road joins Route 95, leaves the valley of Zintalapa, and rises to Petapa (88 m.); thence it continues E. through fine, hilly, and fairly wooded country. San Antonio (99 m.). Road passes to the S. of the village of Ocozocoautla (117 m.). Tuxtla Gutierrez (137 m.).

ROUTE 94

TEHUANTEPEC (Oaxaca)—SAN BENITO (Chiapas),
about 328 miles

Direction SE. Both termini are near the Pacific coast. Tehuantepec and Tapachula are connected by railway (see Appendix III, Sections xxx and xxxi), distance by rail 277 m. In 1897 there was also a boat service between Tonalá and San Benito, and mails were conveyed by this means. The road follows the littoral. It was partly rebuilt before 1895, but according to an account of 1909 it is much worn and hemmed in by bushes. The surface is sandy and level. Distances as far as Tonalá only approximate. On leaving Tehuantepec the road is fairly broad and almost straight. Juchitan, city (18 m.); road crosses a river before entering the city and another river about 7 m. further on. Several small streams

come down from the Sierra on l. and run SW. into the sea. Union Hidalgo, ? village. Niltepec, village (48 m.) on the bank of a river. Zanatepec, village (58 m.).¹ Road crosses several small streams. Tapanatepec, village (76 m.). Between Juchitan and Tapanatepec a good track can be followed, which leaves main road at Union Hidalgo, a village? just beyond Juchitan, runs more to the S. close to the bank of various lagoons, through the villages of Chicapa and Ixhuatan, and rejoins main road at Tapanatepec. Beyond Tapanatepec road enters the State of Chiapas. A road continues E. to Tuxtla Gutierrez, see Route 95; present route bends SSE., through Junta (118 m.), S. of Jalisco, to Tonalá, city (130 m.). Beyond Tonalá the road continues SE. near the coast, between wooded hills on the l. and open country on the r. Ocuilapa (138 m.). Marias (146 m.). San Pedro, ? hacienda (? 154 m.). Palos (161 m.). Mosquito (172 m.). Pijijiapan, village (137 m.). Río Bobo (204 m.). Mapaxtepec, village (223 m.). Ixcuintla (244 m.). Pueblo Nuevo, village (254 m.). Huistla, village (270 m.). Huehuetan, village (285 m.). Tapachula, city (306 m.). San Benito or Soconusco (328 m.).

ROUTE 95

TEHUANTEPEC (Oaxaca)—TUXTLA GUTIERREZ (Chiapas),
219 miles

Direction E. No railway communications. The road is suitable for wheeled traffic and much used by ox-carts, but, according to information dated 1909, it is not in good repair. On leaving Tehuantepec Route 94 is followed as far as Tapanatepec (76 m.). Present route continues E. and enters the State of Chiapas. Laurel, hacienda (99 m.). San Mateo (121 m.). Llano Grande, hacienda (138 m.). Jiquipilas, village (160 m.). Thence by Route 93 (B) to Tuxtla Gutierrez, city (219 m.).

¹ According to another estimate the distance from Tehuantepec to Zanatepec is 86 m.

ROUTE 96

TUXTLA GUTIERREZ (Chiapas)—SAN JUAN BAUTISTA (Tabasco)

Direction NNE. There are no railway communications, but Rio Grijalva, also called Rio Chiapas and Rio Mescalpa in the upper course, connects the two cities of Chiapa and San Juan Bautista and is navigable to some extent. Two land routes are available.

(A) *Via Pichucalco*. The road is said to be suitable for wheeled traffic, and in 1909 was in excellent condition as far as San Cristobal. On leaving the city of Tuxtla Gutierrez the road goes E., making a detour via San Cristobal; a shorter and more direct track goes N. and rejoins main road at Pichucalco, but it cannot be used by carts. Present route follows the main road. Chiapa, city (8 m.); before entering the city road crosses Rio Grijalva by a fine suspension-bridge. The city lies low; beyond it the road rises considerably and passes over undulating ground to Ixtapa (26 m.), a village on a plateau edged by deep gorges. Road enters very mountainous district, winds considerably down to Rio Hondo and up the opposite slope, thence through Burrero, hacienda and Zinacantan, an Indian village, surrounded by pine covered hills, to the city of San Cristobal de las Casas (55 m.),¹ situated in a broad fertile valley. Main road continues SE. to Comitán; see Route 97. Present route turns N. or NNW. Catate (73 m.). Bochil (91 m.). Jitotol, village (99 m.). Pueblo Nuevo de Jitotol (109 m.). San Bartolome Ginebra (125 m.). Tapilula, village (130 m.). Ishuatan (135 m.). Sacualpa or Isacualpa, hacienda (143 m.), alt. 1,280 ft. Solusuchiapa, village (159 m.), alt. 722 ft. Road leaves the higher mountains and passes through hilly region. Ixtacomitan, town (167 m.). Pichuchalco, town (180 m.), alt. 330 ft. Road enters the plains and crosses Rio Azufre which marks the boundary of the States of Chiapas and Tabasco (195 m.). Teapa, city (216 m.). Pueblo Nuevo

¹ According to another estimate the distance from Tuxtla Gutierrez to San Cristobal is 62 m.

de las Raices, village (253 m.). San Juan Bautista, city (268 m.).

(B) *Via Simojovel*. Nature of road not stated. Route (A) is followed as far as San Cristobal (55 m.). Beyond the city present route appears to go due N. through San Andres (70 m.). Platanos, village (83 m.). San Juan, village (96 m.). Simojovel, town (107 m.). San Pedro (114 m.). Sacajtic or ? Sacaltic, hacienda (130 m.). Amatan or ? Amatlan, village (146 m.). Road enters State of Tabasco. Tapijulapa, village (159 m.). Tacotalpa, town (172 m.). Jalapa, town (188 m.). Pueblo Nuevo de las Raices, village (199 m.). Road rejoins Route (A). San Juan Bautista (214 m.).

ROUTE 97

TUXTLA GUTIERREZ (Chiapas)—GUATEMALA CITY, 391 miles

Direction SE. Tuxtla Gutierrez has no railway communications, but the Pan-American railway follows the Pacific coast and connects Salina Cruz and Tonalá with Guatemala, city, see Appendix III, Section xxxi. Up to the frontier of Guatemala the road is said to be in good condition and suitable for wheeled traffic. In Guatemala it degenerates into a horse-track with very steep grades. From Quezaltenango onward it is again used by carts and fairly level but dusty. Route 96 is followed as far as San Cristobal Las Casas (55 m.), thence SE. along main road through Teopisca, town (70 m.). Amatenango, village (76 m.). Yalpujui (86 m.). Comitán, city (107 m.). Juncana, hacienda (122 m.). Road enters Guatemala (150 m.) and descends steeply to Nenton, customs-house of Guatemala (162 m.), situated on a tributary of Rio de Chiapas, or Rio Grijalva, 3,150 ft. above sea-level. Steep ascent out of the valley on to a plateau; country rather bare, most of the forests having been destroyed; hills covered with shrubs, and few patches of oak-trees. Road continues to rise through pine-groves and through gorges to the village of San Andres Petapa (172 m.), on a high ridge, about 4,920 ft. above sea level. Road undu-

lates and winds considerably through San Marcos, and after a steep descent reaches Jacaltenango, a village (180 m.).¹ Road climbs the ridge of Cuesta de la Concepcion, and narrows to a mere horse-track on the opposite side as it descends to the village of San Martin. After another rise road reaches the village of Todos los Santos or Cuchumatlan (204 m.), situated on a plateau covered with maize-fields, alt. about 8,860 ft. ; mountains hem it on all sides. Road continues to rise through fine mountain scenery. Most of the streams are crossed by light wooden bridges. The pass is about 11,615 ft. above sea-level. The road is good while it continues for a considerable distance at high altitudes, but becomes extremely difficult where it begins to descend into a deep valley, passing Las Calaveras, a rancho on a narrow ridge, to the town of Chiantla (230 m.), at the bottom of the valley. Beyond Chiantla the road improves. A road goes ESE. through Santa Cruz Quiche and rejoins main road at Chimaltenango. Present route continues S. ; road very fair. Huehuetenango, city (234 m.) ; road passes over a ridge to Malacatan (243 m.), and continues over undulating ground through maize-fields and pine-forests to Agua Caliente (258 m.), a village in a deep valley. Road rises from the valley and winds considerably. Calél, an Indian village among corn-fields. Steep rise over clayey soil ; very fine pine and fir-trees. Summit of mountain pass, alt. about 10,830 ft. Road improves ; steady descent to Siha or Zija and Olin-tepec, village, and thence to Quezaltenango or Xelahun (282 m.), a city situated in a fine broad valley, alt. about 8,200 ft. Beyond Quezaltenango the road forks ; l. branch, used by the stage coach and wheeled traffic, goes ENE. through Totonicapan (295 m.) and Tecpam (about 334 m.) ; the r. branch, used by horses and mules, goes E. over a high ridge to Nahuala, a large Indian village, and passes through volcanic region ; at Solola (324 m.) it meets a road coming from Totonicapan, and descends through tropical forests along

¹ The distance from Nenton to Jacaltenango appears to have been underestimated in the itinerary followed above. The telegraph line which connects the two localities is 28 m. long.

the bank of Lake Atitlan to Patzun (345 m.) and thence to Patzizia (353 m.), where it rejoins the l. branch referred to above. Both roads are about the same length, the l. branch being wider and more level but very dusty, the r. branch narrower and shaded but more sinuous. Beyond Patzizia the road is wide, fairly level, and dusty; it passes through Zaragoza Chimaltenango, city (360 m.), Zumpango (368 m.), Santiago (374 m.), and Mixco (382 m.), to Guatemala, city (391 m.).

ROUTE 98

TUXTLA GUTIERREZ—PALENQUE (Chiapas), 199 miles

Direction NE. No railway communications. Nature of road not stated. Route 96 is followed as far as San Cristobal de las Casas (55 m.), where present route appears to turn NNE., to Huistan, village (70 m.). Conculum or Concul (91 m.). Zitala (112 m.). Chilon, town (125 m.). Yajalon (135 m.). Tumbala, village (146 m.). Sabana (167 m.). Palenque, town (199 m.).

ROUTE 99

TUXTLA GUTIERREZ (Chiapas)—**HUIMANGUILLO** (Tabasco),
163 miles

Direction N. There are no railway communications, but Rio Grijalva, also called Rio Chiapas and Rio Mescalpa in the upper course, connects Chiapa city (8 m. to E. of Tuxtla Gutierrez) with Huimanguillo, and is navigable to some extent. Nature of road not stated. Distances from Tuxtla Gutierrez: San Fernando, village (13 m.). Usumacinta, village (33 m.). Chicoasen, village (40 m.). Coapilla, village (62 m.). Ocotepec, village (75 m.). Chapultenango, village (96 m.). Nicapa, village (109 m.). Sunuapa, village (122 m.). Paso Real (136 m.). Boca del Platanal (148 m.). Route crosses Rio Grijalva which marks the boundary between the States of Chiapas and Tabasco. Huimanguillo (163 m.), a town on the N. or l. bank of Rio Grijalva.

ROUTE 100

SAN ANTONIO (TEXAS, U.S.A.)—SALTILLO (Coahuila),
466 miles

Direction SSW. The cities are connected by railway (Appendix III, Section viii) ; distance by rail from Piedras Negras or Eagle Pass to Saltillo $273\frac{1}{2}$ m. The condition of the road varies considerably. It is apparently good as far as the Rio Grande, then degenerates into a mere track, with short sections fit for wheeled traffic. After leaving San Antonio the road goes W., running close to the railway. Hondo, town (41 m.). Uvalde (84 m.). Road turns SW. away from railway and branches. Present route follows l. branch, and crosses Rio de las Nueces (97 m.). Wilderness (107 m.). Burke (128 m.). The branches, referred to above, meet again (141 m.). Eagle Pass (147 m.). The road now rejoins the railway and crosses Rio Grande, which marks the boundary between the United States and the Mexican State of Coahuila. Piedras Negras (150 m.), first Mexican town, on r. bank of Rio Grande. The carriage road continues as far as Villa del Fuente (153 m.), beyond which town only a track is available, which follows up the r. bank of a tributary of Rio Grande. Zaragoza, town (178 m.). Zaragoza is the terminus of a short branch line. Diligences run between Zaragoza and Zacapoaxtla (time 3 to $3\frac{1}{2}$ hrs.) and also between Zaragoza and Tlatlauqui (time $2\frac{1}{2}$ hrs.). Present route bends SSE. along the railway. Morelos, town (182 m.). Allende, railway junction (187 m.). Track crosses main line and continues S. Blanco (222 m.). Track joins main line and follows to l. of it to Sabinas, town (230 m.). Track bends SE. along a small branch line to San Felipe, village (241 m.). A cart-road goes E. to Juarez. Present route bends S. along a cart-road. Hondo (244 m.). Progreso, town (263 m.). A cart-road goes NE. to Juarez, 28 m. distant ; another SE. to Lampazos, 50 m. distant ; and a third SSE. to Villadama, about 83 m. distant. Present route goes SSW. Hermanas, hacienda (285 m.). The cart-

road continues WSW. to Cuatro Cienegas. Present route follows a track running to the l. of the railway. Adjuntas (298 m.). Monclova, city (312 m.). Present route intersects Route 8 and continues S. along the railway, following a cart-road. Castaños, village (321 m.). At m. 333 road forks. Present route follows l. branch and continues to the l. of the railway. Bajan (342 m.). Joya (352 m.). Road crosses a corner of the State of Nuevo Leon. Espinazo (366 m.). Road re-enters State of Coahuila. La Paria (374 m.). A track leads S. via Mesillas (417 m.). to Saltillo, city (442 m.). Present route continues SSW. along the cart-road, which runs close to the railway. Venadito (391 m.). Road crosses railway line to Monterrey. A track follows the railway. Present route continues S. Pantano (413 m.). Jaral (421 m.). A track goes S. to Patos or General Zepeda, where it links up with Route 20. Present route goes SE. Rosa, hacienda (429 m.). Road follows up a small river in easterly direction. Saltillo, city (466 m.).¹ In 1897 diligences were plying between Jaral and Saltillo.

ROUTE 101

NUEVO LAREDO (Tamaulipas)-ZARAGOZA (Coahuila)

Direction NW. Railway communications exist via Monterrey (Appendix III, Sections vii and viii), distance by rail about 433 m. This route links up the city of Nuevo Laredo, the frontier station of the National Railway (Appendix III, Section vii), with the Mexican International Railway (Appendix III, Section viii) and the town of Zaragoza. A track is followed which begins in the State of Tamaulipas and runs near the r. bank of the Rio Grande. After a few miles it crosses a narrow strip of territory belonging to the State of Nuevo Leon; but the greater part lies in the State of Coahuila. According to a recent map the track lies as follows: Colombia, village (25 m.), terminus of a short branch line. Route enters State of Coahuila (30 m.). Hidalgo, town

¹ According to an itinerary of Velasco the distance from San Antonio to Zaragoza is 232 m., and the total distance to Saltillo 537 m.

(33 m.). About 2 m. beyond the town route crosses Arroyo de Agua Verde, a tributary of Rio Grande. Route crosses another tributary of Rio Grande (63 m.). Another tributary is crossed at m. 76. Guerrero, town (86 m.). A track goes SSW. to Juarez, about 55 m. distant; another track goes W. to Naza, a station on the Mexican International Railway, about 28 m. distant. Present route continues NNW. along the Rio Grande. San Vicente (91 m.). Route crosses a tributary of Rio Grande (101 m.). Route crosses another tributary (111 m.). Piedras Negras (113 m.). Thence by Route 100 to Zaragoza, town (141 m.).

According to an itinerary of Velasco, a more direct track is as follows: Toritos (19 m.). Paraje del Pan (39 m.). Iglesias, ? village (60 m.). Amole (78 m.). Zaragoza (107 m.). But the track cannot be identified on the map.

ROUTE 102

SALTILLO (Coahuila)—SAN LUIS POTOSI, 291 miles

Direction S. Present route follows a track which runs close to the railway (Appendix III, Section vii); distance by rail 242 m. Distances from Saltillo, city: Buenavista, hacienda (8 m.). A road goes W. to Durango; see Route 20. Agua Nueva, hacienda (21 m.). Encarnacion, hacienda (57 m.). San Salvador (83 m.). Route enters State of San Luis Potosi. Salado, hacienda (104 m.). Las Animas (122 m.). Vanegas or San Juan de Vanegas, hacienda (143 m.). San Cristobal (158 m.). Guadalupe El Carnicero, hacienda (180 m.). Laguna Seca, hacienda (198 m.). Charcos, hacienda (211 m.). Moctezuma or Venado, city (226 m.). Hedionda (240 m.). Bocas, hacienda (260 m.). Peñasco, hacienda (278 m.). San Luis Potosi, city (291 m.).

ROUTE 103

SALTILLO—TORREON, 213 miles

Direction W. Distance by railway 190 m. (Appendix III, Section vii). From Saltillo Route 20 is followed to Viesca,

town (166 m.), whence a track leads NNW. to the l. of the railway. Route crosses Rio Aguanaval (194 m.). Mieleras (207 m.), a station on the line from Torreon to Zacatecas. Torreon, city (213 m.), where present route links up with Route 25.

ROUTE 104

NUEVO LAREDO (Tamaulipas)—MONTEREY (Nuevo Leon)

Direction SSW. Distance by railway, 167 m. (Appendix III, Section vii). Various routes are available.

(A) *Via Cerralvo*. Except for short distances tracks only are available. Beyond Cerralvo the route cannot be identified on the map. A track leaves Nuevo Laredo and follows the r. bank of Rio Grande. Guerrero, city (52 m.). Route bends SW. up the l. bank of Rio Salado and follows a good carriage-road. Salado ? (56 m.). Road crosses Rio Salado and bends SSE. Flores (62 m.). A track goes WSW. ; see Route (C). Present route continues SSE. along a carriage-road, passing through numerous localities. Rebote (65 m.). Sabinillas (72 m.). Coronel (75 m.). Charco (78 m.). Mier, city (83 m.). A carriage-road continues SE. ; see Route 106. Present route branches off to W. along a track and enters State of Nuevo Leon. Route crosses a river (88 m.). Route crosses a tributary of the same river (97 m.). Route meets a carriage-road and turns S. along it. Agualeguas (115 m.). General Treviño, town (120 m.). Mesa (128 m.). Cerralvo, town (137 m.). The carriage-road followed up to this point bends SE. and leads to the railway station of Herreras, about 23 m. distant. Thence the distance by rail to Monterey is 70 m. (Appendix III, Section vii). From Cerralvo a track is said to go SW. It cannot be identified on the map, but according to Velasco it is as follows : Marin, town (161 m.). Agua Fria (174 m.). Monterey, city (192 m.).

(B) *Via Lampazos*. Route follows a track, running within a short distance of the railway. A few miles W. of Nuevo Laredo route enters State of Nuevo Leon. Sanchez (10 m.). Track forks : r. branch crosses the railway at Jarita, goes W.,

then S., and ultimately rejoins main route at Lampazos. Present route follows l. branch, turns slightly away from the railway, crosses a ridge (21 m.), then crosses Rio Camaron (34 m.), and Rio Salado near Rodriguez (45 m.). Thence it continues close to the railway. Mesa (54 m.). Mojina (58 m.). Lampazos, city (72 m.). Track bends S. along the railway. Brasil (79 m.). Track crosses to r. of railway. Salome Botello (87 m.). Track crosses to l. of railway. Bustamente, town (106 m.). Villadama, town (110 m.). A cart-road bends NW to Monclova; see Route 8. A track leads ENE. to Guerrero, city; see below Route (C). Present route continues S. along the railway. Cuevas (119 m.). Palo Blanco (137 m.). Lambdin (147 m.). Track crosses to r. of railway. Morales (152 m.). Salinas Victoria, town (162 m.). South of Salinas the track cannot be identified, but is said to pass through Nicolas de los Garzas, town (175 m.). Monterey (189 m.).

(C) *Via Sabinas*. Route (A) is followed to Flores (62 m.), whence present route follows a track branching off to W. up the valley of Rio Salado. Track bends SW. up the valley of Rio Sabinas, a tributary of Rio Salado. Route crosses to l. bank of river (90 m.). Route crosses to r. bank before reaching Sabinas Hidalgo, town (108 m.). After leaving the town route recrosses to l. bank of river. Route crosses to r. bank (117 m.). Route crosses to l. bank (130 m.). Villadama town (139 m.). Thence Route (B) is followed to Monterey (218 m.).

ROUTE 105

MONTEREY-DOCTOR ARROYO (Nuevo Leon)

Direction S. Alternative routes are available:

(A) *Via Linares*. Route follows the railway (Appendix III, Section ix) as far as Linares (91 m. by rail), beyond which point a carriage-road is available. Distances from Monterey, city: Guadalupe, town (3 m.). Juarez, town (14 m.). Cade-reyta Jimenez, city (26 m.). Purisima, hacienda (47 m.). Montemorelos, city (73 m.). San Cristobal (88 m.). Linares, city (112 m.). A road (or track?) continues SSE., along the

railway, to Victoria; see Route 112. Present route turns W. along a carriage-road. Route crosses a river (122 m.). Bañito (135 m.). Iturbide, town (140 m.). Puerto (152 m.). Santa Rita (155 m.). Galeana, city (158 m.).¹ A track comes in from N.; see below, Route (B). Present route bends S. Santa Clara (167 m.). Pablito (172 m.). San Enrique (190 m.). Ascension, congregacion (203 m.). Aramberri, town (217 m.). Doctor Arroyo, city (about 250 m.).¹

(B) *Via Rayones*. From Monterey present route follows a track S. to Santiago, town (16 m.), whence a carriage-road is available. Margarita (22 m.). Allende, town (29 m.). Loma Prieta, congregacion (32 m.). Blanquillo (36 m.). Montemorelos, city (46 m.). Present route meets Route (A), but turns off SW. along a carriage-road. Gil de Leyva, village (50 m.). Concepcion, village (54 m.). Boca, congregacion (61 m.). Rayones, town (70 m.). Carriage-road ends. Present route continues S. along a track to Galeana, city (85 m.), whence Route (A) is followed to Doctor Arroyo (about 177 m.).

ROUTE 106

MATAMOROS—NUEVO LAREDO (Tamaulipas), 199 miles

Direction NW. The termini are both situated on the r. bank of Rio Grande del Norte. Distance by railway, via Monterey, 372 m. (Appendix III, Section vii). Nature of road uncertain between Matamoros and Camargo. Beyond that point a carriage-road is available as far as Guerrero. Distances from Matamoros, city: Reynosa or Reinos, town (34 m.). Camargo, city (86 m.). Route crosses Rio San Juan, a tributary of Rio Grande (98 m.). Banchetias (101 m.). Guardado de Arriba (108 m.). Flores (111 m.). Mier, city (116 m.).² Thence Route 104 (A) is followed to Nuevo Laredo, city (199 m.).

¹ According to an itinerary of Velasco the distance to Galeana by this route is 148 m. According to the same itinerary the total distance to Doctor Arroyo is only 188 m.

² According to an itinerary of Velasco the distance to Mier is only 107 m., and the total distance to Nuevo Laredo 185 m.

ROUTE 107

MATAMOROS (Tamaulipas)—SALTILLO (Coahuila), 250 miles

Direction W. For railway connexion see Appendix III, Section vii; distance by rail, 271 m. Most of the way the road runs at a considerable distance from the railway and is more direct. Nature of road not stated. Distances from Matamoros city: Santa Rosalia (17 m.). Guadalupe de los Brasiles (29 m.). Tulitos (34 m.). Santa Cruz (42 m.). Charco Escondido, congregacion (53 m.). Road enters State of Nuevo Leon. Chapotito (72 m.). Coma (80 m.). General Bravo, town (109 m.). China, town (117 m.). Cuchillo (119 m.). Ebanito (140 m.). Santa Isabel (156 m.). Lantrisco, ? hacienda (160 m.). Cadereyta Jimenez, city (173 m.). Thence by Route 105 (A) to Monterey, city (199 m.). Beyond Monterey the road continues W. to Jagüey, ? hacienda (204 m.). Molino de Jesus Maria (204½ m.). Santa Catarina, town (205 m.). San Rafael or Montejano (210 m.). San Jose (215 m.). Rinconada, hacienda (222 m.). Muertos (227 m.). Road enters State of Coahuila. San Gregorio (232 m.). Paso del Aguila (237 m.). Ramos Arizpe, town (240 m.). Puente de los Bosques (243 m.). Peña (246 m.). Saltillo, city (250 m.).

Between Matamoros and Coma there appears to be an alternative track through Palo Blanco (26 m.). Cayetano (39 m.). San Domingo (57 m.). Torrecillas (73 m.). Coma (92 m.).

ROUTE 108

MATAMOROS—CIUDAD VICTORIA (Tamaulipas), 227 miles

Direction SSW. For railway connexion via Monterey see Appendix III, Sections vii and ix; distance by rail, 381 m. Nature of road not stated. Distances from Matamoros: Moquete (24 m.). Quijano (37 m.). Santa Teresa (50 m.). Llano del Tejon (71 m.). San Fernando, town (94 m.). Chorreras (117 m.). Encinal (139 m.). Ceja (154 m.). Jimenez, town (162 m.). A road goes SSE. to Tampico; see Route 109. Marquesotes (175 m.). Padilla, town (193 m.). Güemez, town (211 m.). Ciudad Victoria, city (227 m.).

ROUTE 109

MATAMOROS-TAMPICO (Tamaulipas), 332 miles

Direction S. For railway connexion via Monterey see Appendix III, Sections vii and ix ; distance by rail, 527 miles. Nature of road not stated ; the course is uncertain beyond Soto la Marina. Route 108 is followed as far as Jimenez (162 m.). Present route turns off SSE. Abasolo, town (177 m.). Palo Alto (188 m.). Soto la Marina (208 m.), a town and river port on the l. bank of Rio Soto la Marina, Santander, or de la Purificacion, 39 m. from its mouth. The river is said to be navigable for 87 m. Cruces (226 m.). Realito (236 m.). Bejarano (245 m.). Sanapa (255 m.). Aldama, town (265 m.). Cuestecitas, hacienda (277 m.). Loma de la Cruz or Paso del Estero (298 m.). Altamira, town (316 m.). Tampico, city (332 m.).

ROUTE 110

SOTO LA MARINA-CIUDAD VICTORIA (Tamaulipas), 83 miles

Direction W.. No connexion by railway. The road is said to be suitable for wheeled traffic. It connects the port of Soto la Marina, on the l. bank of the river of the same name, with Ciudad Victoria, passing through Puerta (26 m.), Casas, town (52 m.), and Petaqueño (67 m.), to Ciudad Victoria (83 m.).

ROUTE 111

TAMPICO-CIUDAD VICTORIA (Tamaulipas), 170 miles

Direction NNW. The road appears to run close to the railway (see Appendix III, Section ix) ; distance by rail, 146 m. Nature of road not stated. Distances from Tampico : Altamira, town (16 m.). A track goes N. to Soto la Marina ; see Route 109. Present route continues NW. Esteros de la Tuna (42 m.). Chocoy (55 m.). Main road bends W. to San Luis Potosi ; see Route 114 (A). Present route continues NW. Cojo, hacienda (73 m.). Alamitos (86 m.). Pretil (97 m.). Panocha, hacienda (107 m.). Forlon, hacienda (117 m.).

A carriage-road with diligence service connects the railway station of Forlon with the town of Lleba Canales or ? Llera, 13 m. away. Pastor (149 m.). Ciudad Victoria (170 m.).

ROUTE 112

MONTEREY (Nuevo Leon)—CIUDAD VICTORIA (Tamaulipas),
214 miles

Direction SSE. Road appears to follow fairly close to the railway (see Appendix III, Section ix); distance by rail, 176 m. Nature of road not stated. Route 105 (A) is followed as far as Linares (112 m.). Beyond Linares road enters State of Tamaulipas. Villagran, town (149 m.). A road with diligence service connects the town with the station of Garza Valdez, $7\frac{1}{2}$ m. distant. Hidalgo, town (170 m.). Santa Engracia, hacienda (193 m.). Ciudad Victoria (214 m.).

ROUTE 113

CIUDAD VICTORIA—SAN LUIS POTOSI, 262 miles

Direction SW. There are railway connexions via Tampico (Appendix III, Sections ix and viia), distance 421 m., and via Monterey (Appendix III, Sections ix and vii), distance 484 m.; but the road is much more direct. The road is suitable for wheeled traffic, and has been recently rebuilt as far as Cerritos; beyond that point traffic is mainly by railway, and the road, though it was originally well planned, is much neglected. Diligences run from Ciudad Victoria to Cerritos. Distances from Ciudad Victoria: Paraje de Minas (21 m.). Mulita (31 m.). Maroma, hacienda (40 m.). Jaumave, town (47 m.). Palmillas, town (60 m.). Presas (75 m.). Norias (88 m.). Tula, city (101 m.). Borrega, hacienda (112 m.). Viga (119 m.). Coronel, hacienda (132 m.). Viguita (140 m.). Road enters State of San Luis Potosi. Hincada, hacienda (153 m.). A road goes ESE. to Tampico; see Route 114 (A). Buenavista (155 m.). Sauz (172 m.). Cerritos, city (187 m.). Road rises steadily. San Isidro (198 m.). Puerto de San Jose (211 m.). Tejon (216 m.). Redonda (229 m.). Colorado

(231 m.). Corcovada, hacienda (234 m.). Puerto Blanco (245 m.). Palma Cerrada (252 m.). Soledad, town (259 m.). San Luis Potosi (262 m.).

From Hincada (153 m.) there appears to be an alternative road which avoids Cerritos. It passes through Buenavista, ? hacienda (163 m.). Quelitál (174 m.). Vejo (185 m.). Rincon de Turrubiates (198 m.), and rejoins main route at San Isidro (211 m.).

ROUTE 114

TAMPICO-SAN LUIS POTOSI

Direction W. For railway connexion see Appendix III, Section viia; distance by rail, 275 m. Three roads are available :

(A) *Via Ciudad del Maiz*. Along an ancient main (?) road. Route 111 is followed as far as Chocoy (55 m.), where present route turns W. Carrizo (70 m.). Magiscatzin, city (91 m.). Alternative Route (B) continues NW. ; present route turns W. Boca de Abraham (122 m.). Antiguo Morelos, town (133 m.). Nuevo Morelos, town (146 m.). Road enters State of San Luis Potosi. Sabinito (159 m.). Lobos (176 m.). Route (C) joins main road; the latter descends from a wooded slope to a broad valley, and farther on ascends through groves of evergreen oak to a wide and well-cultivated plain covered with maize-fields. Ciudad del Maiz, city (195 m.), at the end of the plain. A carriage-road, with diligence service, connects Ciudad del Maiz with the railway station of Las Tablas, 30 m. SW. From Ciudad del Maiz road rises through a deep valley to Hincada (216 m.), where it unites with Route 113, and continues along it to San Luis Potosi (325 m.).

(B) *Via Tula*. Route (A) is followed as far as Magiscatzin (91 m.), where present road continues NW. Limon (107 m.). Comandante (117 m.). Cucharas (128 m.). Chamal (141 m.). Santa Barbara (151 m.). Laja (167 m.). Gallos, hacienda (180 m.). Boquilla (190 m.). Tula, city (200 m.). Thence by Route 113 to San Luis Potosi (361 m.).

(C) *Via Tancanhuitz*. As far as Tanquian the old high road

to Queretaro is followed. In 1889 it was in a bad state of repair and very muddy in parts; it afforded, however, a broad clear track through the woods, and was suitable for wheeled traffic, but except near the littoral there appear to be no bridges. Between Tanquian and Lobos the road is difficult, and apparently little better than a horse track. Distances only approximate. On leaving Tampico, Rio Tamesi is crossed by ferry and route enters State of Vera Cruz. From Las Matias, opposite Tampico, there is a motor road as far as Panuco, town (30 m.) with a ferry at Topila Astero. The trip from Las Matias to Panuco takes $2\frac{1}{2}$ hrs. Beyond Panuco the river is crossed by a tottering wooden bridge; road passes through fields and pasture land partly covered with bushes. Miradores (37 m.). After passing through some marshy ground road hardens and traverses a wood to Tanjuco (57 m.) on Rio Panuco. Farther on the country is bleak and monotonous. Pueblo Viejo (75 m.) on r. bank of Rio Moctezuma; river forded, narrow but deep, to Tantojon, on opposite bank. Road again enters a wood. Tancuiche. From here the old bed of Rio Moctezuma can be followed. Road enters State of San Luis Potosi. San Vicente or Tancuayalas, town (83 m.), on the old bed of Rio Moctezuma. Road continues through woods and pastures to Tanquian, town (93 m.). In this neighbourhood main road appears to continue SW. to Queretaro; see Route 115; present route goes S. ? through pasture land and bamboo groves to Tierra Blanca. Road, marshy at first, improves farther on as it rises to dry undulating ground. Tampamolón, town (110 m.). Road turns NW. ?, follows up a narrow valley and becomes very difficult, interrupted in places by landslides. Tancanhuitz (131 m.), a small city on both banks of a tributary of Rio Moctezuma. Road, very muddy and slippery after rain, descends to Anquismon, a large straggling village (139 m.). Road, very sinuous and difficult, passes alternately down deep gorges and over spurs of the Sierra de Anquismon. La Garita; Rio de la Garita forded. A little farther on Rio Tambaque, a torrent, is crossed by a tottering bridge. Santa Cruz. San Pablo. San Fran-

cisco. Beyond this, road reaches the broad sandy banks of Rio Verde (158 m.); small ferries for passengers; horses swim across the river. Road through woods, muddy after rain. Ojital. Road, at first through woods, then enters open fields, and passes to W. of Ciudad de Valles. Buenavista. Road winds through forests. Otate. Road enters deep gorge and climbs a ridge to San Dieguito; thence down a wooded slope and through a valley with sugar-cane plantations to Gallinas hacienda. Road thence over mountain pass and down along stony bed of a torrent into a deep gorge. Crucitas (208 m.). Road near railway embankment for a short distance. Salto. Road with deep ruts crosses fields. Espiritu Santo. Charcos. Road passes over rocky hills, wooded peaks on both sides, and enters level country with some swampy places, through Estribos, to Naranjos, on a river of the same name; river forded, fine bamboos along the banks. Road rises out of the valley, passes over a ridge to Huamuchil, thence over another ridge to Platanito, and over a third ridge into the wide valley of Santa Barbarita, covered with short grass. At Lobos (236 m.), beyond the next ridge, Route (A) is rejoined and followed to San Luis Potosi (385 m.).

ROUTE 115

TAMPICO-QUERETARO, 264 miles

Direction SW. The railway makes a wide detour via San Luis Potosi (see Appendix III, Sections viia and vii); distance by rail, 434 m. The present route is more direct and follows an old highway. For description as far as Tanquian (93 m.) see Route 114 (C); beyond that point the course is somewhat uncertain, but the road is said to pass through the following places: Axtla, town (101 m.).¹ Rio Huichihuayan (106 m.). Tamarindo (106½ m.). Xilitla, town (112 m.). Xilitlilla (117 m.). Cueva Prieta (120 m.). Potrerillos, hacienda (122 m.). Road enters State of Queretaro (126 m.). Lobo

¹ According to another estimate the distance from Tampico to Axtla is only 54 m.

(127 m.). Madroño (129 m.). Cumbre Mal Pais (134 m.). Arroyo de la Vuelta (138 m.). Encino Solo (139 m.). Hondo (141 m.). Landa, village (145 m.). Mazacuitla or ? Mazancintla (148 m.). Tancama (151 m.). Arroyo Acatitlan (155 m.). Acatitlan (156½ m.). Puerto Hondo (160 m.). Puerto de Ojo de Agua (163 m.). Puerto de Tonicato (164 m.). Tonicato (166 m.). Arroyo de Escanela (167 m.). Santa Florentina (169 m.). Puerto del Oro (172 m.). Amoles, village and mine ? (174 m.). Thence by Route 71 (A) to Queretaro (264 m.).

ROUTE 116

TAMPICO-MEXICO CITY

Direction SSW. There is an indirect railway connexion via San Luis Potosi (see Appendix III, Sections viia and vii); distance by rail, 602 m. Two roads are available.

(A) *Via Real del Monte*. The route lies along an old highway. Pueblo Viejo, town (3 m.). Tampico Alto, town (9 m.). Arroyo del Monte (11 m.). Escribano (13 m.). Jobo (16 m.). Tortuga (18 m.). Arenal (19 m.). Sauz (21 m.). Llano de Bustos, hacienda (25 m.). Uña de Gato (32 m.). Encinal (38 m.). Chichimeco (40 m.). Arroyo Barranco (47 m.). Ozuluama, town (52 m.). Guadiana (54 m.). Loma Alta (57 m.). Aguada (59 m.). Puente (65 m.). Machorra (67 m.). Jardin (70 m.). Comales, hacienda (71 m.). Pesero, ? hacienda (73 m.). Piedras Negras (76 m.). Chote (81 m.). Potrero (84 m.). Aquichal (88 m.). Monte Negro (89 m.). Tantoyuca, town (91 m.). Rio Calabozo (99 m.). Road enters State of Hidalgo. Hules (104 m.). Atlapexco, village (126 m.). Suchititlan (136 m.). Huitznopala, hacienda (139 m.). Yactipan or ? Yatipan (146 m.). Tlacolula, village (154 m.). Chapala or ? Chapula, village (160 m.). Hormiguero (161 m.). Amajac, village (167 m.). Pinolco ? (169 m.). Cuautlilla or ? Coatlila, village (171 m.). Zacualtipan, town (180 m.). A road with diligence service connects Zacualtipan with Apulco, the present terminus of a

railway line from Tepenacasco, (see Appendix III, Section xv). There is apparently an alternative route from here via Molango, town, rejoining main road at Atotonilco, but it is about 35 m. longer. Acuilcalco (190 m.). Rio Grande (195 m.). Cerro Colorado (201 m.). Zoquitlan, hacienda (207 m.). Atotonilco el Grande, town (213 m.). Omitlan, village (224 m.)¹ A wide carriage-road goes to Pachuca, 10 m. distant; there is a regular diligence service between Atotonilco and Pachuca station via Omitlan. Real del Monte, village (226 m.). There is a diligence service between this village and the station of Pachuca, distance $5\frac{1}{2}$ m. Zoyoatla (232 m.). San Cayetano (234 m.). Jagüey de Telles (242 m.). Road enters State of Mexico. San Mateo Ixtlahuaca, village (250 m.). Santa Anita (256 m.). Tecamac, village (262 m.). Santa Ana (263 m.). San Martin (263 $\frac{1}{2}$ m.). Cuautliquisca San Francisco, village (264 m.). Ozumbilla, village (265 m.). Ojo de Agua, hacienda (266 m.). Chiconcuautla Santo Tomas, village (268 m.). Chiconcuautla Santa Maria (269 m.). Venta de Carpio (270 m.). Palacio de los Virreyes and Monumento de Morelos (272 m.). Tulpetlac, village (274 m.). Puerto de Cerro Gordo (275 $\frac{1}{2}$ m.). Santa Clara Cuautitla, ? village (276 m.). Jaloxtoc or Xalostoc San Pedro, village (276 $\frac{1}{2}$ m.). El Risco, hill (278 m.). Road enters Federal District. Atzacalco or ? Atzacapotzalco, town (279 m.). Guadalupe Hidalgo, city (281 m.). Mexico City (285 m.).

(B) *Via Pachuca*. This road provides an alternative between Atotonilco el Grande and Tecamac. In 1912 the section from Pachuca to the capital was under reconstruction. Route (A) is followed as far as Atotonilco el Grande (213 m.), thence present route goes to Pachuca, city (231 m.), an important railway junction. Cuescotitlan, ? hacienda (233 m.). Quesada or Quezada (239 m.). Zapotlan, village (245 m.). Puerto de la Escondida (251 m.). Tizayuca, village (256 m.). Road enters State of Mexico. Reyes, village (261 m.). Garita del peaje or ? toll office (262 m.). Redonda, hacienda (264 m.).

¹ According to the diligence time-table the distance from Atotonilco to Omitlan is only 8 m.

Tecamac, village (265 m.). Route (A) is rejoined and followed to Mexico City (288 m.).

ROUTE 117

RIOVERDE (San Luis Potosi)—QUERETARO, 167 miles

Direction SSW. This route links up Rioverde, the terminus of a branch railway (see Appendix III, Section vii a), with Queretaro. There is a railway connexion via San Luis Potosi (see Appendix III, Sections vii a and vii); distance by rail, 264 m. On leaving the city of Rioverde a good road is available, along which there is a daily service of diligences to San Ciro (31 m.), the diligence taking $4\frac{1}{2}$ hrs. for the journey in each direction. Thence route rather uncertain, few of the localities mentioned in the itinerary can be identified; road appears to continue SSE., and to enter the State of Queretaro. Arroyo Seco, village (about 46 m.). Paso del Perico (51 m.). Paraje de los Fierros, ? hacienda (64 m.). Mesa del Durazno, ? hacienda (67 m.). Paraje de los Fierros (73 m.). Arteaga, ? mine (80 m.). Charcas or ? Charcos (87 m.). Torbellino, ? hacienda (90 m.). Arroyo del Carricillo (98 m.). Peñamiller, village (101 m.). Thence by Route 71 (B) to Queretaro (167 m.).

ROUTE 118

ALAUQUES—RAYON (San Luis Potosi), 25 miles

Direction S. This carriage-road connects the termini with Cardenas, a station on the San Luis Potosi—Tampico Railway (Appendix III, Section vii a). The diligences which run daily take 6 hrs. for the complete journey in each direction. Distances from the town of Alauques: Cardenas (12 m.). Rayon, city (25 m.).

ROUTE 119

TAMPICO—TLAXCALA, about 287 miles

Direction S. No railway communication. There are two fair motor roads from Tampico to the Tepetate oil fields (about 60 m.) following the Huasteca pipe line right of way and the

Gulf Oil Co. right of way. In a Ford car, the time from the Panuco River to Tepetate varies from $3\frac{1}{2}$ to 6 hrs. The better time can be made over the Huasteca right of way. These two roads join at Horconcitos, W. of N. end of Juana Ramirez Island. These roads are suitable for three-ton trucks. The oil companies use both four-wheel drives and caterpillars. During the rainy season (June–September) the roads are difficult of passage. On both roads a number of rivers have to be crossed by ferries. On the Gulf Oil Co.'s right of way there is a ferry at the Llave River, about 19 m. from Tampico, and S. of the junction, one at La Laja Estero, one at the Cucharres River, and one at Carvajal on the San Diego River. At any of these points it would be possible to cross with horses, but not with vehicles. From Tepetate a truck road, good except after heavy rains, leads to Maumey, a port with a wharf on the San Diego River. S. of Tepetate the route is uncertain, mule-tracks only being available as far as Potrero del Llano (about 90 m.). From Potrero there is a good road along the Aguila Co.'s pipe line right of way to Tumbadero on the N. bank of the Tuxpan River. Tuxpan, city (about 115 m.). The river bar is about $7\frac{1}{2}$ m. E. From Tuxpan city present route proceeds along an old highway connecting Tuxpan port on the Gulf of Mexico with Mexico City. Cabellos Blancos (116 m.). Tuxpilla (119 m.). Avalito (129 m.). Tecoxtempa, congregacion (132 m.). Horcon (133 m.). Tihuatlan, village (137 m.). Papa Clarillo (144 m.). Miahuapa, congregacion (149 m.). Micos (152 m.). Biscuautla (156 m.). Agua Fria (159 m.). Mesa de San Diego (163 m.). Tultitlan (167 m.). Huilotla, congregacion (171 m.). Zoquiapa (173 m.). In this neighbourhood road enters State of Puebla. Apapantitla, village (175 m.). Reforma (180 m.). Atequixtla (186 m.). Jicotepec or Xicotepec, town (193 m.). Dos Caminos, hacienda (196 m.). Rio Necaxa (199 m.). Huauchinango, city (203 m.). A road goes WSW. to the village of Acaxochitlan (Hidalgo) and thence to the station of Panfilo; see Appendix III, Section xv. Zacatlan, city (about 228 m.). A road with diligence service connects the city with the station

of Ahuazotepec, $15\frac{1}{2}$ m. away ; time $4\frac{1}{4}$ hrs. from Ahuazotepec to Zacatlan, but $5\frac{1}{2}$ hrs. for return journey. From Zacatlan a carriage road is available. Chignahuapan, town (235 m.). Peñon del Rosario (245 m.). Road enters State of Tlaxcala. Tlaxco, town (261 m.). Terminus of a branch line (see Appendix III, Section xxiii). From Zacatlan to Tlaxco diligences take 9 hrs., but only 8 hrs. on the return journey. Payuca ($263\frac{1}{2}$ m.), San Baltasar (266 m.), Zacapexco, hacienda (268 m.). Trasquila, hacienda (274 m.). Zacatepec ($274\frac{1}{2}$ m.). Yauhquemehcan, village ($278\frac{1}{2}$ m.). Belen Santa Maria, village (283 m.). Tlaxcala, city (287 m.). Route joins the high road from Vera Cruz to Mexico City, see Route 125 (B).

ROUTE 120

TUXPAN (Vera Cruz)—PUEBLA

Direction SSW. Railways are available for last section of the route. Various roads can be followed.

(A) *Via Tlaxcala*. Along Route 119 to Tlaxcala (172 m.), thence by Route 125 (B) to Puebla (193 m.).

(B) *Via Teziutlan*. The road appears to be used to some extent for wheeled traffic, but it is difficult and in poor condition. Between Papantla and Teziutlan it is very sinuous and rises over 5,000 ft. Distances from Tuxpan, city : Cazoñes, congregacion (23 m.). Aguacate (42 m.). Santa Agueda, congregacion (47 m.). Papantla, town (55 m.). Alternative Route (C) leaves main road ; another road goes E. to Tecolutla, see Route 121. Laja (86 m.). Tlapacoyan, town (100 m.). A road goes E. to Nautla, see Route 122. Pochotitla (101 m.). Buenavista ($101\frac{1}{2}$ m.). Platanosapan, congregacion ($102\frac{1}{2}$ m.). Dos Cerros (103 m.). Aguatinapa (104 m.). Mojon (105 m.). Ecoxtoc (106 m.). In this neighbourhood road enters State of Puebla. Cruz Alta (107 m.). Dos Caminos, hacienda (108 m.). Napopoale (109 m.). Palenque (110 m.). Ilititan ($110\frac{1}{2}$ m.). Capulines ($111\frac{1}{2}$ m.). Barrio Estafiata ($112\frac{1}{2}$ m.). Aguata (113 m.). Chinanlingo ($113\frac{1}{2}$ m.).

Teziutlan, city (115 m.). Here the road links up with the railway to San Marcos (185 m.) and Puebla (219 m.); see Appendix III, Section xvii. From Teziutlan present route turns E? and re-enters State of Vera Cruz. Jalacingo, town (about 125 m.). Atzalan, town (131 m.). Road turns S. Altotonga, town (135 m.). Road very bad. Perote, town (about 147 m.). From Perote to Altotonga the diligence takes 3 hrs. At Perote present route links up with the railway and the old high road from Vera Cruz to Mexico City, see Route 125 (A). If the latter is followed the total distance to Puebla is about 225 m.

(C) *Via Tlatlauquitepec*. This road provides an alternative between Papantla and Teziutlan. Route (B) is followed to Papantla (55 m.), where present route branches off to r. Paso del Correo (71 m.). Paso de Puxtla (76 m.). Espinal, congregacion (86 m.). Chacal (89 m.). Comalteco, congregacion (91 m.). Ilatmaco (94 m.). Trapiche Viejo (99 m.). Yolotzin (104 m.). In this neighbourhood road enters State of Puebla. Hueyapan, village (115 m.). Tlatlauquitepec, town (120 m.). Teziutlan, city (about 130 m.). Thence by Route (B) to Puebla (240 m.).

ROUTE 121

TECOLUTLA (Vera Cruz)-PUEBLA, about 201 miles

Direction S.W. No railway communications. In 1909 the road was described as very fair. Tecolutla, a village on the Gulf of Mexico, is connected with Nautla by a horse-track following the coast-line. On leaving the bar of Tecolutla, present route follows the l. bank of a river. Cabezas (8 m.). Cepillo (16 m.). Barriles (18 m.). Cazonera (21 m.). San Pablo, congregacion (29 m.). Papantla, town (31 m.). According to a more recent account the main road passes through Gutierrez Zamora, village (about 12 m.). Beyond Papantla Route 120 (B) is followed to Puebla (201 m.).

ROUTE 122

NAUTLA (Vera Cruz)-PUEBLA, about 165 miles

Direction SW. No railway communications. The present route connects Nautla, a small port on the Gulf of Mexico, with the railway at Teziutlan, and thence with Puebla and Mexico City. Nature of road not stated. Distances from the Bar of Nautla: Nautla, village (2 m.). Cabeza de Cedro (4 m.). Peña (6 m.). Gallineros (7 m.). Jicaltepec, congregacion of French colonists ($8\frac{1}{2}$ m.). A road goes S. to Jalapa; see Route 123. Casa del Arbol (11 m.), Pital ($12\frac{1}{2}$ m.). Boca Chica (14 m.). Tulapa (16 m.). Cabestros (18 m.). Vado, or ford, of Rio Maria de la Torre ($18\frac{1}{2}$ m.). Flamencos (21 m.). Piedra Grande (22 m.). Cañizo (23 m.). Paso de Novillos or Martinez de la Torre (26 m.). Mirador (27 m.). Maloapa (28 m.). Ixcacuaco (29 m.). Arroyo de Piedra, rancho (31 m.). Palmilla ($31\frac{1}{2}$ m.). Pajaritos (34 m.). Filipinas (35 m.). Jobo, hacienda (36 m.). Tlapacoyan, town (40 m.). Thence by Route 120 (B) to Puebla (165 m.).

ROUTE 123

NAUTLA-JALAPA OR XALAPA (Vera Cruz), 82 miles

Direction S. No railway communications. This route connects Nautla, a small port on the Gulf of Mexico, with the railway and the old highway from Vera Cruz to Mexico City at Jalapa; see Route 125 (A). On leaving the Bar at Nautla Route 122 is followed to Jicaltepec ($8\frac{1}{2}$ m.); present route turns S. or SSE. along a poor road which, according to information dated 1909, becomes almost dangerous after rain. There is a considerable rise to Misantla (38 m.),¹ a town 1,345 ft. above sea-level. Road sinuous but much better; except for some steep grades and the dangerous ford at Misantla, it might be described as good. In 1909 a bridge across the Misantla had been projected. Chiconquiaco, congregacion (56 m.).

¹ According to another estimate the distance from Nautla to Misantla is only 26 m.

Steep rise, alt. 5,250 ft. to Naolinco, town (67 m.). Jalapa or Xalapa, city (82 m.).

ROUTE 124

BARRA DE PALMAS-JALAPA (Vera Cruz), about 64 miles

Direction SSW. No railway communications. This route connects Barra de Palmas, a small rancho on the Gulf of Mexico, with the railway and the old highway from Vera Cruz to Mexico City at Jalapa. Nature of road not stated. On leaving Barra de Palmas road goes SSW. to Misantla, town (about 20 m.), rising from the sea-coast to an altitude of 1,345 ft. Beyond Misantla Route 123 is followed to Jalapa (about 64 m.).

ROUTE 125

VERA CRUZ-MEXICO CITY

Direction W. There are two railways following approximately the course of the old highways, i.e. via Jalapa (see Appendix III, Section xvi, distance 294 m., and via Cordoba (Appendix III, Section xxiii), distance 264 m.

(A) *Via Jalapa.* A wide well-built road, compared by Humboldt with the roads of the Simplon and Cenis. It rises from the sea-shore to the high central plateau. In certain sections it winds considerably to reduce the gradient. Substantial bridges cross all streams. Under Spanish rule the road was well kept, as silver was conveyed by it to the port of Vera Cruz. Since the advent of railways the state of the road was allowed to deteriorate. In 1912, however, the road was thoroughly repaired. A tramway appears to follow the road from Paso de San Juan to Jalapa. On leaving Vera Cruz the road runs northwards along the littoral. Boca del Potrero (14½ m.). Neveria (16½ m.). Salsipuedes (17½ m.). Puente del Tio Carmona (18 m.). Paso de San Juan (18½ m.). Bridge ¼ m. beyond. Antiguo Paso de San Juan (19¼ m.). Caca-huatal (19½ m.). Tula (20 m.). Zopilote (21 m.). Puente Nuevo de Tierra Colorada (22½ m.), Boqueron (23½ m.),

Cuartana (25½ m.), Tolome Nuevo (27 m.). Bridge ½ m. beyond. Comite (28 m.). Cumbre de Paso de Ovejas (30 m.). Cumbre Salida de Paso de Ovejas (31 m.). Patanquenal (32 m.). Puente de Paso Lagarto (34 m.). Paso del Conejo (35 m.). Puente Nacional, bridge and village (36½ m.). Road enters more undulating country. Tamarindo (38 m.). Neve-ria Grande (39½ m.). Peniche (40½ m.). Calera (41 m.). Rinconada, congregacion (42 m.). Vigia (45 m.). Organos (47 m.). Palo Gacho (48 m.). Laja (49 m.). Cumbre de Plan del Rio (49½ m.). Plan del Rio, congregacion (50½ m.). Dos Caminos (52 m.). In this neighbourhood the road turns to the interior and rises steadily through a deep gorge, Cañada de Cerro Gordo (53 m.). Cerro Gordo, rancho (56 m.). Bandera (57½ m.). Higuera Grande (58½ m.). Corral Falso, congregacion (60½ m.). Mirador (62 m.). Puente de Dos Rios (64 m.). Encero, hacienda (65 m.). Consuelo (66 m.). Mata Obscura (67 m.). Pajaritos, congregacion (68 m.). Trancas de Apache (69 m.). Espinazo del Diablo (69½ m.). Animas (70½ m.). Garnica (71 m.). Palo Verde (71½ m.). Casa de Badillo (72 m.). Garita de Vera Cruz (72½ m.). Jalapa or Xalapa, city (73 m.). A road goes N. to Nautla, see Route 123; another road S. to Orizaba, see Route 128. Present route reaches an altitude of over 4,200 ft. and continues to rise. Garita de Mexico (74 m.). Alcantarilla Lagunilla (76 m.). Puente de Sedeño (77 m.). Banderilla, village (78½ m.). Piletas (80 m.). Aguacate (81 m.). San Miguel del Soldado, village (82 m.). Muralla Grande (83 m.). Pajarillos (85 m.). Cruz Verde, bridge and rancho (85½ m.). Olla (86½ m.). Tlostlacuaya (89 m.). Paraje de Cerros (90½ m.). Encino Gacho (91 m.). Las Vigas (92½ m.). Manzanillo (94½ m.). Barranca Honda (95 m.). Puente de Rio Frio Chiquito (96½ m.). Cruz Blanca (97½ m.). Barranca Seca (99½ m.). Puente de Sierra de Agua (100½ m.). Molino, or mill, del Paraje San Jose (102 m.). Perote, town (105 m.). A road goes N. to Teziutlan, see Route 120 (B); another road S. to Orizaba, see Route 129. After rising to an altitude of 7,900 ft. road enters central plateau of Mexico. Between

Perote and Amozoc distances are only approximate. Road enters State of Puebla. Tepeyahualco, village (about 123 m.). Ojo de Agua, village (145 m.). Nopalucan, village (?). Venta del Pinal (160 m.). Acajete, village (167 m.). Amozoc, town (174 m.). Route (B) via Orizaba joins present route ; another road goes SSE. to Oaxaca, see Route 86. Venta de las Animas (175½ m.). Chachapa, village (177 m.). Puebla, city (183 m.). Route (B) again separates from present route and turns N. to Tlaxcala City. Cuautlancingo, village (193 m.). Ocotlan San Francisco, village (196 m.). San Antonio Miahuaco, ? village (197 m.). Santa Clara, hacienda (200 m.). Santo Domingo, hacienda (201 m.). Venta de la Costa (203 m.). San Bartolo, hacienda (205 m.). San Baltazar, village (207 m.). Texmelucan San Martin, city (209 m.). Route (B) rejoins present route. San Lucas, village (212 m.) ; road enters State of Mexico. Venta de Palmillas (214 m.). Venta de Buenavista (216 m.). Venta de Apapapasco (218 m.). Agua de Venerable (223 m.). Rio Frio, village (226 m.). Cumbre de Rio Frio (229 m.). Venta de Llano Grande (229½ m.). Barranca de Juanes (231 m.). Venta de Cordoba (235½ m.). Venta Nueva (237 m.). Ixtapaluca, village (241 m.). Acozac, hacienda (241½ m.). Walls (paredones) of the village of Tlapacoya (243 m.). Ayotla, village (244 m.). Tlapizahua, village (245½ m.). San Isidro, hacienda (246 m.). Reyes, village (248 m.). Road enters Federal District. Venta del Peñon Viejo (252 m.). Mexico City (260 m.).

(B) *Via Orizaba and Tlaxcala.* The road is similar to that described above, but certain sections, especially between Vera Cruz and Orizaba, are liable to be very muddy after rain. It is said that before the construction of the railway the diligence, by means of relays, covered the whole distance from Mexico City to Vera Cruz in 3 days in fine weather ; but that after rain the journey often required 10 to 20 days from Vera Cruz to Orizaba. On leaving Vera Cruz the road turns WSW., rising very gently. Tejeria (9 m.), alt. 109 ft. Purga (19 m.), alt. 147 ft. Soledad de Doblado or Soledad

de Hernandez y Hernandez, town (26 m.), alt. 305 ft. From this point onward road rises considerably. Camaron, congregacion (39 m.), alt. 1,115 ft. Paso del Macho (47 m.), alt. 1,560 ft. Road passes over undulating ground. Rio San Alejo (51 m.). Paso del Chiquihuite (51½ m.). Atoyac, congregacion (53 m.), alt. 1,510 ft. Road again rises steeply. Cordoba, city (65 m.), alt. 2,713 ft. A road goes N. to Jalapa, see Route 128. Fortin, congregacion (70 m.), alt. 3,306 ft. Metlac, bridge and barranca (71½ m.). Orizaba, city (81 m.), alt. 4,025 ft. Road forks; one branch follows the railway via Santa Cruz (86 m.), Maltrata, village (91 m.), alt. 5,547 ft., Boca del Monte, in the State of Puebla (105 m.), alt. 7,923 ft., Esperanza, hacienda (108 m.), and San Andres hacienda (about 125 m.).¹ Main road is along the other branch, and passes through Ingenio (84 m.), Tecamalucan, hacienda (90 m.), San Diego, hacienda (95 m.), and Acultzingo or Aculcingo, village (95½ m.); enters State of Puebla, and proceeds via Ixtapa or San Jose Ixtapa, village (108 m.), to San Andres, village (124 m.). The branches referred to above meet again. Between San Andres and Amozoc distances are only approximate. Road passes through Acatzingo, town (about 149 m.), to Amozoc, town (about 169 m.). Thence by Route (A) to Puebla City (178 m.), where present route leaves main road and turns N. Molino (183 m.). Road enters State of Tlaxcala. Tlaxcala City (199 m.). Road turns W. Panotla, village (202 m.). Ixtacuixtla San Felipe, village (205 m.). Road re-enters State of Puebla and rejoins main road at Texmelucan San Martin, city (211 m.). Thence by main road, Route (A), to Mexico City (262 m.).

ROUTE 126

VERA CRUZ-HUATUSCO, 65 miles

Direction W. No railway communications. Nature of road not stated. Distances from Vera Cruz : Medellin, town

Between Maltrata and San Andres there appears to be a shorter road or track via San Antonio de Abajo, hacienda (103 m.) to San Andres (113 m.).

(13 m.). Tlacotepec San Martin, village (47 m.). Tenampa San Francisco, village (49 m.). Santa Maria Acomapa (52 m.). Totula Santiago, village (60 m.). Huatusco San Antonio, city (65 m.), alt. 4,400 ft. By Route 128 Huatusco is connected both with Jalapa and Orizaba.

ROUTE 127

ORIZABA (Vera Cruz)-TEHUACAN (Puebla), 36 miles

Direction SW. The termini are connected by a railway via Esperanza (see Appendix III, Sections xxiii and xxvii); distance by rail 61 m. On leaving Orizaba the highway, Route 125 (B), is followed to Acultzingo, village ($14\frac{1}{2}$ m.), where present route turns in southerly direction and enters the State of Puebla. Chapulco, village (27 m.). Tehuacan, city (36 m.), where the main road from Puerto Angel to Mexico City is joined, see Route 86.

ROUTE 128

ORIZABA-JALAPA (Vera Cruz), about 73 miles

Direction N. A railway is available as far as Coscomatepec which may ultimately be continued to Jalapa, the section from Teocelo to Jalapa being already completed (see Appendix III, Sections xxiii and xvi). The road appears to be a horse-track only; it is very fair between Coscomatepec and Huatusco. On leaving Orizaba the highway to Vera Cruz, Route 125 (B), is followed to Cordoba, city (16 m.), alt. 2,713 ft. Present route turns N., rising considerably to the town of Coscomatepec (about 30 m.), alt. 5,200 ft. Road passes over undulating country. Huatusco San Antonio, city (42 m.), alt. 4,400 ft. A road goes E. to Vera Cruz; see Route 126. Present route continues N. San Bartolo Axcuapan, village (47 m.). Ohuapan, congregacion (51 m.). Rio Huitzquilapan (54 m.). Teocelo de Diaz, city (63 m.). Jalapa, city (73 m.).

ROUTE 129

ORIZABA-PEROTE (Vera Cruz)

Direction NNW. The termini are connected by railway via San Marcos (see Appendix III, Sections xxiii, xvii and xvi); distance by rail 115 m. Two roads are available.

(A) *Via San Andres.* Route 125 (B) is followed to San Andres (43 m.), where present route turns NNE. Cuantotolapa (69 m.). Perote, town (85 m.).

(B) *Via Jalapa.* Route 128 is followed to Jalapa (73 m.); thence Route 125 (A) to Perote (105 m.).

ROUTE 130

VERA CRUZ-COSAMALOAPAN

Direction SSE. There is a railway as far as Alvarado (see Appendix III, Section xxiv). Small steamers ply on Laguna Camaronera between Alvarado and Tlacotalpan, time 3 hrs. Nature of road not stated. Distances from Vera Cruz: Boca del Rio, village (6 m.). Hato (18 m.). Salinas, congregacion (23 m.). Alvarado, city (36 m.).¹ Tlacotalpan, city (67 m.). Cosamaloapan, town (93 m.).

ROUTE 131

VERA CRUZ-PUERTO MEXICO, about 179 miles

Direction SE. Communications by sea, and by railway (see Appendix III, Sections xxv and xxx), distance by rail 285 m. Nature of road not stated. On leaving Vera Cruz Route 130 is followed to Alvarado, city (36 m.); thence present route continues at first close to the sea-shore. Meson (64 m.). Santiago Tuxtla, town (85 m.). San Andres Tuxtla, city (92 m.), alt. 1,185 ft. Corral Nuevo, ? hacienda (118 m.). Acayucan, town (147 m.). Socunusco, village (149 m.).

¹ According to another estimate the distance from Vera Cruz to Alvarado is 42 m.; by rail it is 43½ m.

Jaltipan, town (152 m.).¹ A road continues E. to San Juan Bautista; see Route 132. Present route turns ENE. and appears to follow the railway; distances only approximate. Chinameca, village (156 m.). Limones, hacienda (161 m.). Puerto Mexico, town (179 m.), terminus of the Tehuantepec Railway.

From Alvarado the journey can be continued by small steamer to Saltabarranca, village, whence a horse-track leads to San Andres Tuxtla.

ROUTE 132

VERA CRUZ—SAN JUAN BAUTISTA, about 347 miles

Direction ESE. No railway communications. Between Huimanguillo and San Juan Bautista the journey can be done by boat on Rio Grijalva. Nature of road not stated. Route 131 is followed to Jaltipan, town (152 m.); present route continues E. Cosoleacaque, village (159 m.). Minatitlan, town (165 m.),² terminus of a small branch linking up with main line at Carmen. Paso Nuevo (175 m.). Ixuatlan, town (179 m.). Moloacan, village (182 m.). Tigre (191 m.). In this neighbourhood road enters State of Tabasco. San Jose del Carmen, hacienda (227 m.), not to be confused with Carmen, the railway junction in Vera Cruz, or with the Gulf port of the same name. Zanapa, village (253 m.). Ocuapan, village (276 m.). Huimanguillo, town (290 m.), on the l. bank of Rio Grijalva, a navigable river. A road goes S. to Tuxtla Gutierrez; see Route 99. Present route turns NE. to San Antonio (300 m.). Another branch appears to go further N. via Cardenas, town. Cunduacan, city (321 m.). San Juan Bautista, city (347 m.). For continuation of the road to Campeche see Route 134.

¹ According to another estimate the distance from Santiago Tuxtla to Acayucan is only 26 m. According to the same estimate the distance from Acayucan to Jaltipan is 16 m.

² According to another estimate the distance from Jaltipan to Minatitlan is 21 m.; Minatitlan to Moloacan, 27 m.; Moloacan to San Jose del Carmen, 37 m.; San Jose to Zanapa, 53 m.

ROUTE-133

TLAXCALA-APAM (Hidalgo), 46 miles

Direction NNW. Distance by railway 44 m. (see Appendix III, Section xxiii). Nature of road not stated. Distances from Tlaxcala: Panotla, village ($2\frac{1}{2}$ m.). Santa Maria (5 m.). Temetzontla, village ($7\frac{1}{2}$ m.). San Mateo Huexoyuca, village (10 m.). San Sebastian (12 m.). Ixcotla or Ixcotlan Santa Maria, village (13 m.). Hueyotlipan, village (17 m.). Española, village (23 m.). Calpulalpan San Antonio, village (33 m.). San Lorenzo Techalote, hacienda ($39\frac{1}{2}$ m.). Road enters State of Hidalgo. Marañon, hacienda (44 m.). Apam, town (46 m.).

ROUTE 134

CAMPECHE-SAN JUAN BAUTISTA (Tabasco)

Direction WSW. No railway communications. The journey can be undertaken by land or by water.

(A) *Land route.* Nature of road not stated; it is probably an ill-defined track, and numerous rivers must be crossed. Distances from Campeche City: Seibaplaya, town (16 m.). Champoton, town (31 m.). Xcalaltok (52 m.). Sabancuy, village (73 m.). Aguada (88 m.). Puerto Real (91 m.). Boca Nueva (101 m.). Carmen, city (110 m.). Pom (136 m.). Road enters State of Tabasco?. San Pedro (162 m.). Barra Principal (172 m.). Escobas (203 m.). San Juan Bautista, city (235 m.).

(B) *Water route.* From Carmen the journey may be made by land, crossing a shallow estuary (light bamboo vehicles used for the purpose) to the mouth of Rio Palizada (about 150 m. ?), time about 3 hrs. Thence by small steam-launches; which ply regularly on these water-ways, up Rio Palizada, crossing border of State of Tabasco; Jonuta, town (about 180 m.), Frontera, city (about 240 m.), San Juan Bautista, city (about 290 m.). The journey requires about 2 days from Carmen to San Juan Bautista.

ROUTE 135

CAMPECHE-MERIDA

Direction NE. The road appears to run close to the railway (see Appendix III, section xxxii); distance by rail 107 m. Nature of road not stated, but said to be passable by carts. Distances from Campeche city : Hampolol, village (8 m.). Tenabo, village (21 m.). Pomuch, village (29 m.). Hecelchakan, town (31 m.).¹ Poeboc, village (34 m.). Cibalche (42 m.). Calkini, town (44 m.). Road enters State of Yucatan. Halacho (52 m.). Maxcanu, town (62 m.). Kopoma, village (70 m.). Chochola, village (78 m.). Uman, town (89 m.). Merida, city (99 m.).

ROUTE 136

CAMPECHE-GUATEMALA CITY, 747 miles

Direction S. No railway communications. The road is one of the chief trading routes in this part of the country. On reaching Concepcion it widens into a first-class road. It is in constant use by collectors of chicle and mahogany, and is kept in good repair. In addition to the main route described below there appears to be a more direct horse-track from Campeche through the haciendas of Castamay or ? Castamar (7 m.), Chencoyi (18 m.), and Cayal (25 m.), which rejoins main road at Cibalchen (62 m.). On leaving Campeche, main route lies along Route 135 to Hecelchakan, town (31 m.), where it turns ESE. Tanchi, hacienda (34 m.). Cetchen or Jotchen, hacienda (42 m.). Bolonchen or Bolonchenticul, village (62 m.). From Hecelchakan a shorter road is said to be through Halal, hacienda (47 m.), rejoining main route at Bolenchen (60 m.), but, according to a map of 1918, Tanchi, Cetchen, and Halal are situated on one and the same road. Main route continues to Hopelchen, town (83 m.). Cibalchen, village (106 m.). Xicichan (127 m.). Norku (145 m.).

¹ Measured on the map the distance from Campeche to Hecelchakan is about 40 m.

Teop, hacienda (157 m.?). Route crosses Rio Mamental. Chumke (167 m.). Tenchay (188 m.). San Antonio (195 m.). Route crosses main tributary of Rio Mamantel. A good road goes ESE. to Chichancha; see Route 140 (B). Main road leads to Ecoana (209 m.). Concepcion (223 m.?). From here a horse-track goes NNW. through the villages of Chanlaguna (36 m.) and Silvituc (57 m.) to Champoten (about 95 m.), a village on the Gulf of Mexico. After leaving Concepcion main route crosses Rio Santa Cruz. Chuncruz (237 m.). Paybano or Paisban? (260 m.). Native tracks lead through the forest in the direction of Chichancha and British Honduras. In this neighbourhood road appears to cross the frontier of Guatemala. Rio Cucho (278 m.). Sacchich (297 m.). Santa Rita (310 m.?). A road goes E. via Santa Cruz to the New River Lagoon in British Honduras. Present route continues to San Miguel (320 m.). Peten, lagoon (344 m.). Santa Anna (357 m.). Rancho de Cal or Chal (380 m.). Dolores (403 m.). San Luis (435 m.). Tuncal or Tzuncal (461 m.). Tuila (487 m.). Champamac or Campamac (521 m.). Cajabon or Cahabon (554 m.). San Agustin (576 m.). Coban (602 m.). Santa Cruz (615 m.). Tactik (628 m.). Salama (669 m.). Chuacu or Chuacus (679 m.). Rio Grande (692 m.). Lo de Iboy (716 m.). Carrizal (721 m.). San Rafael (729 m.). Chinautla (742 m.). Guatemala City (747 m.).

ROUTE 137

CAMPECHE-BACALAR (Quintana Roo)

(A) Direction SE. No railway communications. Nature of road not stated. On leaving Campeche Route 135 is followed to Cibalche (42 m.), where present route appears to turn E. and enters the State of Yucatan. Nohcacab (68 m.). Road intersects Route 138. Oskutzcab, village (85 m.). Tixcuytun, village (100 m.). Chacsinkin, village (114 m.). In this neighbourhood road appears to enter the Territory of Quintana Roo. Tonotchil (132 m.). Pinchakab (155 m.).

Polyuc (181 m.). Bacalar, ? hacienda (264 m.). Bacalar is situated on a lagoon which communicates with Rio Hondo, on the frontier on British Honduras, and thence with the Bay of Chetumal, by means of a creek said to be navigable by shallow-draught steamers for six months in the year. For roads to Santa Cruz de Bravo and Chichancha, see Route 141.

(B) A map of 1918 shows a road which appears to follow an itinerary slightly different from that given above. On leaving Cibalche (42 m.), it turns SE. to Compick, ? = Combek (50 m.). Samak (59 m.). Road bends E. and enters the State of Yucatan (73 m.). Xul, village (87 m.). Road intersects Route 139. Road bends SE. to Halal (107 m.) and enters Territory of Quintana Roo. ? Chenkubul (120 m.). Road bends S. Yokhom (144 m.). A road continues S. to Chichancha and links up with Route 140. Present route bends E. Chun or ? Chum (151 m.). Road bends SSE. Medina (175 m.). Route crosses Laguna San Felipe (195 m.). Bacalar (202 m.).

ROUTE 138

BOLONCHEN (Campeche)—MERIDA, 75 miles

Direction N. No railway communication. Nature of road not stated. Distances from Bolonchen or Bolonchenticul, village: Yaxche, hacienda (5 m.). Chac (12 m.). Road enters State of Yucatan. Nohcacab (21 m.). Road intersects Route 137 (A). Ticul, city (31 m.).¹ Chaca (36 m.). Sacalum, village (39 m.). Mukuiche (49 m.). Uayalceh (54 m.). Xtohil (59 m.). Joyaxche (62 m.). Tacchebichen (70 m.). Tixcacal (73 m.). Merida, city (75 m.).

ROUTE 139

BOLONCHEN (Campeche)—TEKAX (Yucatan), 39 miles

Direction ENE. No railway communication. Nature of road not stated. Distances from Bolonchen or Bolon-

¹ On the map of 1918 the distance from Bolonchen to Ticul is about 35 m.

chenticul, village : San Antonio (8 m.). In this neighbourhood road enters State of Yucatan. Santa Rita (13 m.). Xul, village (26 m.). Road intersects Route 140. Tekax, city (39 m.).

ROUTE 140

BELIZE (British Honduras)—BOLONCHEN

Direction NW. No railway communication. As far as Orange Walk the journey is by water ; a river steamer plies between Belize and Orange Walk. Beyond that point there was, in 1897, only an ill-defined track, but a map of 1918 shows that a road has been constructed as far at least as Chichancha, whence a road or track goes N. to Iturbide, and links up with a wide carriage-road. The details given below are based mainly on an account dated 1897.

(A) On leaving Belize, the capital of British Honduras, route turns N. into the Bay of Chetumal. Corosal (about 100 m.), a town and port near the mouth of the New River, a dull, sluggish stream, navigable for about 70 m. Route follows up the river through San Estevan and Orange Walk (120 m.). From here the journey is continued by land ; a road leaves the river in a westerly direction. As it proceeds inland the vegetation gradually becomes less luxuriant, tracts covered with bushes and swamps alternate with barren, sandy fields on which little grows except sparse grass and clusters of pine-trees. Corosalito (135 m.), a village near which route crosses Rio Hondo, a deep navigable stream which marks the boundary between British Honduras and Mexico. Road passes through Indian territories and finally enters the State of Campeche. Chichancha (175 m.), an important locality, apparently identical with or in the neighbourhood of the Indian village formerly called Ikayche, situated in a fertile plain, surrounded by virgin forests. Maize and beans are extensively grown here. Several important roads or tracks branch off from Chichancha ; one continues WNW. to San Antonio (see Route B), two roads go in a southerly direction across the frontier of Guatemala and

lead respectively to Waiohe and Santa Maria ; another road leads ENE. to Palmar on Rio Hondo. Beyond Chichancha present route turns N. through a wide *akalché* or depression, which in the rainy season is converted into a lake ; such depressions are a common feature. Progress across them is difficult even in the dry season on account of thorns and bushes. Chunhuas, hacienda (181 m.). A road branches off NE. to Bacalar ; see Route 141. Present route passes through dense wood, then over undulating ground and across the dry beds of several rivers. Rain water is obtainable at *aguadas* and at some natural ponds, but towards the end of May the supply generally gives out. As route proceeds N. forests become lighter and *chaparrales*, stony tracts covered with bushes, become the dominant feature. At m. 193 road forks, a road continues N. to Tekax ; present route turns NW. Nalte (205 m.). Road bends N. and passes the SW. extremity of Yok Laguna (220 m.). Palmira (226 m.). A road goes NE. and meets Route 137 (B) at Yokhom. Present route continues N. to ? Kanha or Ixkanha (256 m.). Maben (266 m.). Nohabin (276 m.). Iturbide, village (289 m.). Route leaves the hilly district and enters level country, usually very dry and characterized by the presence of savannas or extensive grass steppes. Good carriage-road goes NW. to Hopelchen, town (308 m.), and thence by Route 136 to Bolonchen (329 m.).

(B) Route (A) is followed to Chichancha (175 m.), where present route continues WNW. along a good road. ? Chuncoloc (188 m.). Xcululche (213 m.). Sayab (225 m.). San Antonio (240 m.). Thence by Route 136 to Bolonchen (about 373 m.).

ROUTE 141

PETO-CHICHANCHA, about 248 miles

Direction S. No railway communication. The road has been constructed recently and, according to information of 1918, is very good all the way. It connects Peto, the present terminus of a railway line from Progreso and Merida, with

Bacalar and Chichancha, the chief Mexican settlements near the border of British Honduras. From the town of Peto the road goes NE., enters the Territory of Quintana Roo and reaches Santa Cruz de Bravo (about 75 m.), the present terminus of a railway from Vigia Chico, a port on the Atlantic. From Santa Cruz de Bravo road turns SSW. ? Nox or Chunox (90 m.). ? Tuxuc (104 m.). Poluin (110 m.). ? Nobbec (116 m.). About m. 118 road forks, both branches meeting again at m. 133. Santa Cruz (135 m.), at the NE. corner of Laguna Balcalab. Road bends SW. and follows the W. shore of the Laguna. Xeb (153 m.). ? Solici (156 m.). Bacalar, ? hacienda (161 m.). A road goes NW. to Campeche ; see Route 137 (A). Present route continues SW. and recedes from the shore of the Laguna. Santa Maria (167 m.). Corosal (179 m.). Nobacal (195 m.). A road goes SE. to Yoxche and thence to Palmar on Rio Hondo ; distance from Nobacal to Palmar about 25 m. Ya Lachospo (222 m.). A road goes ESE. via Yocaroso to the Rio Hondo, about 35 m. distant, and crosses the road from Chichancha to Palmar, referred to under Route 140. Chunhuas (242 m.). Present route meets road from Campeche ; see Route 140 (A). Chichancha (248 m.).

APPENDIX III

RAILWAYS

NOTE.—Reference should be made to the general section on railways in Chap. VI. In the following itineraries only the more important places, junctions, &c., are mentioned. Where the available information allows of distances being given more closely than to the nearest mile, they are given in miles and decimal parts of a mile. Short lines running from points along the main lines are indicated as 'branch lines' or 'tramways' (the distinction, however, is by no means always certain, and the mode of traction cannot in all cases be stated), whether they belong to the same system as the main line or not. Elevations are given in feet, following the names of stations: they are in most cases approximate only.

I.—NOGALES—TEPIC, and LA QUEMADA—ORENDAIN, 1,075 miles (Southern Pacific Rly.)

Southern Pacific System.—The Southern Pacific Railway of U.S.A. has 928 miles of track in Mexico. The property of the Company, whose head-quarters are at New York and general offices at Tucson, Arizona, includes the lines of the former Cananea, Yaqui River, and Pacific Railroad, with the Lomas Junction to Del Rio line, which was acquired in 1909, and the main western route from Guaymas to Tepic. In addition the Sonora Railroad was leased to the Southern Pacific Co. in 1898, so that the system now embraces direct railway communication between Nogales, on the American frontier, and Tepic. From Guadalajara, on the Constitutionalist Railways, a line is being built to Tepic in order to provide through communication with Mexico City. Between Empalme and Tepic are 25 river crossings of considerable size.

On March 16, 1916, the railway was in operation over all sections except that between the Rosario river and Tepic, where operations had been suspended, and at that date a few of the larger bridges, such as that over the Yaqui river, had not been destroyed. Great damage, however, had been done

to the track, and many bridges destroyed. It was stated that the aggregate length of bridges destroyed had been 75,151 ft., including 71 openings, and of this, 5,945 ft. had been destroyed more than once. The damage to rolling-stock had been great and it was stated that the Southern Pacific of the United States had lost about 1,200 freight cars owing to its policy of permitting its cars to go into Mexico for the use of the *de facto* government. A recent statement assigns to the line 64 locomotives, 86 coaches, and 1,313 wagons.

The Government took over this railway in 1917.

Sonora Railway.—In 1909 the Sonora Railroad was reconstructed. This involved the raising of the track, putting in new ties, replacing old bridges, and substituting heavy rails for the former lighter lines. The line is of standard gauge (4 ft. 8½ in.). Heaviest grade is 2 per cent. and smallest curve radius is 574·465 ft.¹ Within this section there were in 1902 bridges and culverts having a total length of 34,017 ft.

miles

- | | |
|---|--|
| 0 | Nogales, 3,869 ft. (see <i>Gazetteer of Towns</i>). Terminus of lines from Tucson and Benson, Arizona, and a point of departure for the Altar mining district. From here line runs generally S. and crosses the divide between the rivers flowing towards the Gulf of California and those flowing eastward. |
| 3 | Lomas. <i>Branch line</i> (formerly part of the Cananea, Rio Yaqui, and Pacific Railroad, see p. 410), 4 ft. 8½ in. gauge, runs generally E. to (4 m.) Puerto Zuelo, 4,910 ft.; along valley of Rio Sonia Cruz and across that river near (36 m.) Santa Cruz, 4,439 ft.; to (78 m.) Del Rio, 4,681 ft., junction with line from Naco to Cananea (Section II). Max. grade, 2·6 per cent.; min. curve radius 625 ft. |
| 7 | Encina, 4,188 ft. Hence a general downward grade to Guaymas. |

¹ *Ry. Age Gaz.*, January 1, 1909.

miles

- 12½ Agua Zarca, 3,816 ft. Here Rio de S. Ignacio is reached and its r. bank followed (at some distance).
- 54 Magdalena, 2,460 ft. (see *Gazetteer of Towns*). Near here line crosses Rio de S. Ignacio.
- 66 Santa Ana, 2,252 ft., distributing centre of Altar mining district. Line proceeds due S. across a level plain.
- 130 Carbo, 1,523 ft.
- 151 Pesqueira, 1,075 ft., for Horcasitas, mining centre.
- 175 Hermosillo, 693 ft. (see *Gazetteer of Towns*). Here Sonora river is crossed by iron bridge, 309 ft. long in 3 spans. Between Hermosillo and Torres line crosses two branches of Sonora river.
- 201 Torres, 538 ft. *Branch line* (Mexican Union Ry. Co.), 3 ft. gauge, to (12·5 m.) Minas Prietas (La Colorada), whence it is completed (1918) for a distance of 38 m. from Torres in the direction of Ures (65 m.), to which town it is intended to be carried. Ruling gradient about 1½ per cent. Rails, 13 m. of 25 lb., 6¼ m. of 30 lb., 18¾ m. of 50 lb. Rolling stock—4 locomotives, 3 passenger coaches, 12 box-cars, 15 flat cars.
- From Minas Prietas there is (?) a line of 2 ft. 3¼ in. to (8 m.) Represo. From Minas Prietas a wagon road leads to San Jose de Pimas, Tecoripa (point for Santa Barbara), San Javier (for the coalfields of Los Bronces), La Barranca, and Toledo (station on the Tonichi branch, see below), all mining centres. From Minas Prietas, another wagon road leads to Lapid (20 m. S.) for the Santa Maria graphite mines.
- 235·5 Ortiz, 347 ft., for San Marcial coalfields. From Ortiz a wagon road, through mining properties, runs to Cumuripa (see below).
- 260 Empalme, 5 ft. Workshops of Southern Pacific system. Machine-shop with 15-ton cranes; erecting

miles

shop with one 100-ton crane. Coal storage capacity, 10,000 tons.

A spur line crosses an arm of the lagoon on an embankment 1 m. long and then follows shore to (265 m.) Guaymas port (see *Gazetteer of Towns*). From Empalme line continues E. to

323

Corral, 122 ft. *Branch line* runs NE. along r. bank of the Yaqui river to (16½ m.) Buena Vista, 194 ft.; (41½ m.) Cumuripa, 285 ft.; (93·8 m.) Toledo, 590 ft. (see above) and (96 m.) Tonichi, 600 ft. From Tonichi it is intended to carry the line along the San Bernardino and Bavispe rivers to join the line to Nacozari (see Section III). Railway beyond Tonichi was in construction to the Cienegueta mining camp, 20 m. SE. of Sahuaripa, in 1909.

Section from Corral to Navojoa has max. grade of 0·5 per cent. and min. curve radius 1,650 ft. S. of Corral line runs generally SE. and crosses Rio Yaqui by large bridge which up to March 1916 had escaped destruction.

376·5

Navojoa, 125 ft. Here Mayo river is crossed by large bridge. *Branch line*, 4 ft. 8½ in. gauge, to (38½ m.) Alamos, 1,282 ft. In 9·3 m. between (23 m.) Maizal and (33 m.) Minas Nuevas line rises 1,010 ft. Max. grade 2·8 per cent.; min. curve radius 625 ft. Alamos is the nearest point to Chinipas, the centre of the Arteaga (Chihuahua) mining district, about 60 m. distant, and with Sanchez (see p. 422) forms the outlet. Chinipas is the distributing centre for the mines at Alguera, Guazapares, Guadalupe, and Guerra al Tinaro. A narrow-gauge steam railway, with 20-ton locomotives, in connexion with an aerial tram, connects the Palmarejo mine with the Chinipas river, 12 m. distant

miles

Section from Navojoa to Culiacan has max. grade of 0.5 per cent. and min. curve radius 925 ft.. Line proceeds over rolling country, nowhere much above 200 ft. high, and crosses numerous rivers.

403 Masiaca, 167 ft.

429 Don, 166 ft. Between Don and Francisco line crosses the Rio de Alamos.

438 Francisco, 141 ft.

460 San Blas, 115 ft. Here the Fuerte river is crossed. River varies from 2 ft. in depth by 250 ft. in width, with a speed of $1\frac{1}{2}$ m. per hour, at extreme low water, to one mile wide, 25 ft. in depth, and with a speed of from 7 to 10 m. during floods. At San Blas is the junction with the Kansas City, Mexico, and Orient Railway to Topolobampo (Section IV). From San Blas line continues between coast and the Alamos range over a rolling, but not difficult, country.

473 Algodon, 198 ft.

491 Naranjo, 152 ft. Between Naranjo and Toruno line crosses the Ocorim river.

493 Toruno, 154 ft. Between Toruno and Bamoa line crosses the Sinaloa river.

504 Bamoa, 138 ft.

513 Capomas, 143 ft. Between Capomas and Guamuchil line crosses the Mocorito river.

526 Guamuchil, 139 ft.

549 Palos Blancos, 192 ft. Between Palos Blancos and Retes line crosses the Tale river.

565 Retes, 114 ft., nearest point to Pericos, the chief district of Sinaloa State for mescal liquor and fibre.

597 Culiacan, 119 ft. (see *Gazetteer of Towns*). Bridge with 14 spans of 70 ft. deck-plate girders, and two spans of 200 ft., of through Pratt trusses.

Branch line (the Occidental, with head-quarters at Mazatlan) to (38 m.) port of Altata. Gauge 4 ft. $8\frac{1}{2}$ in.

miles

From Culiacan line continues southward, approaches the coast near the Piaxtla river, and proceeds to the port of Mazatlan, over a rolling and sometimes hilly country. Max. grade of this section is 0.5 per cent and min. curve radius 1650 ft.

608 San Rafael, 85 ft.

628 Quila, 172 ft. Here the river San Lorenzo is crossed by a bridge of 32 spans of 70 ft. deck-plate girders. Between Quila and Mazatlan the large rivers Elota and Piaxtla, and the smaller river Quelite are crossed. Over the last there is a bridge of 16 spans of 80 ft. deck-plate girders. *Branch line to* (6.4 m.) Comolote and (20 m.) El Dorado, small port.

734 Mazatlan, 4 ft. (see *Gazetteer of Towns*). From Mazatlan to the Santiago river the max. grade is 0.4 per cent. and the min. curve radius is 625 ft. Between Mazatlan and Rosario the Mazatlan river is crossed.

774 Rosario, 55 ft., mining centre. At Rosario the Rosario river is crossed by bridge of 21 spans of 70 ft. deck-plate girders.

789 Escuinapa, 46 ft.

828 Acaponeta, 81 ft. Between Acaponeta and Yago the Rio San Pedro is crossed.

879 Yago, 89 ft. Between Yago and Nanchi the Santiago river is crossed by a bridge of 6 spans of 70-ft. through plate girders, and three 200-ft. spans of through Pratt trusses. From the Santiago river to Tepic the max. grade is about 2 per cent.

A little south of the Santiago river is the small port of San Blas whence there is an abandoned narrow-gauge railway which it had been intended to construct to Tepic over a spiral section through the Barranca Blanca.

882 Nanchi, 106 ft.

miles	
898	Rosetta, 187 ft. Between Rosetta and Aguirre there is a rise of 2,062 ft. in 19 m.
917	Aguirre, 2,249 ft. Between Aguirre and Escobar the rise is 828 ft. in 8 m.
925	Escobar, 3,077 ft.
931	Tepic (see <i>Gazetteer of Towns</i>), present terminus of the railway, whence it will be continued to meet the line from Guadalajara. (Section XXIX.) (<i>The section from Tepic to La Quemada is not completed.</i>)
1007	La Quemada, 4,268 ft., present starting point of the section through Orendain to Guadalajara.
1036	Magdalena, 4,461 ft.
1053	Tequila, 3,997 ft., centre of the <i>tequila</i> liquor industry.
1061	Amatitlan, 4,903 ft. There is a rise of 906 ft. in 8 m. between Tequila and this point.
1066	Quiteria, 4,024 ft. There is a descent of 879 ft. in 5 m. between Amatitan and this point.
1075	Orendain, 4,730 ft. Here the line to Guadalajara is reached (Section XXIX). There is a temporary bridge.

II.—NACO—CANANEA, 38 miles (Southern Pacific Rly.)

The line from Naco to Cananea (formerly part of the Cananea, Rio Yaqui, and Pacific Railroad, see p. 410) is an extension of the railway from Douglas, Ariz., forming part of the El Paso and South-Western system, and is also connected with Benson. Max. grade, 2.45 per cent. ; min. curve radius 715 ft. Gauge 4 ft. 8½ in.

miles	
0	Naco, 4,607 ft., frontier station Line runs in SW. direction to Cananea.
11	San Jose, 5,096 ft.
18	Villa Verde, 4,805 ft.

miles	
29	Del Rio, 4,681 ft., junction with line from Nogales (see p. 411).
38	Cananea, 5,270 ft. (see <i>Gazetteer of Towns</i>) centre of copper district, the mines in which are connected with each other by a standard-gauge railway belonging to the Cananea Consolidated Copper Co.

III.—AGUA PRIETA-NACOZARI, 75 miles (Nacozari Rly.)

The Mexican border is crossed at Agua Prieta by the line of the Nacozari Railroad Co., with head-quarters at New York. This railway runs from Douglas, Ariz., to Nacozari. Max. grade, 1·5 per cent.; min. curve radius 310 ft. Gauge 4 ft. 8½ in. Seven locomotives, 6 coaches, 117 wagons.

miles	
0	Agua Prieta. Between this point and Cima line crosses three branches of the Rio de Agua Prieta.
20	Cima.
33	Fronteras. Hence to Vigia (formerly Cos), line follows left bank of the Rio de Fronteras and crosses three tributaries of that river.
44	Esqueda, for the El Tigre mine and Pilares de Teras, the latter containing one of the largest deposits of low grade sulphide copper in the world.
55	Vigia.
75	Nacozari, mining town, for Cumpas and Moctezuma, on the Rio de Moctezuma, is centre for an extensive mineral district. From this point railway is to be continued to the Yaqui river to join the line from Corral to Tonichi (see p. 413).
	<i>Branch line</i> (private), 3 ft. gauge, to the mines at Los Pilares (7 m.), is laid with 85 lb. steel rails and ballasted with slag and gravel. The rolling-stock consists of two 50-ton Baldwin locomotives and 25-ton and 30-ton Ingoldsby side-dump reinforced steel cars.

IV.—MARQUEZ-CHIHUAHUA-SANCHEZ, 285 miles, and LOS HORNILLOS-TOPOLOBAMPO, 73 miles (Kansas City, Mexico, and Orient Rly.)

The Kansas City, Mexico, and Orient Railway Co., with head-quarters at Kansas City, was incorporated under the laws of Kansas, on April 30, 1900, and is operated in Mexico under the Kansas Charter which has been legalized by the Mexican Government. It was reorganized and re-incorporated in Kansas as the Kansas City, Mexico, and Orient Railroad Co., on July 6, 1914. Like other American railways after the entry of the United States into the war, it came under federal control in 1918, but it was announced in July of that year that the Mexican sections were to be taken over and operated by the Mexican Government under contract for a term of years.

The railway when completed will extend from Kansas City, U.S.A., to Topolobampo, 1,659 m. The distance by the shortest route from Kansas City to San Francisco is 2,016 m. At present the section from Kansas City to Wichita has been graded in portions, but trains run over other systems to this point. From Wichita there is through communication as far as Alpine. Thence the line is under construction to the international boundary which it will cross near El Oro, east of Presidio del Norte in Mexico, and proceed through Rancho Mula and Puerto Monier to Marquez.

From Marquez to Chihuahua, and thence to Sanchez, trains are in operation. From Sanchez grading has been done to Los Trigos. Thence to Hornillos line has been graded in parts and surveyed in others. This section has involved great difficulties of location, and the present route through the Sierra Madre was not found until after 7 years' work. The original plan contemplated a section of 40 m. of cog-railway on a grade of 14 per cent.; after two years a practicable route with grade of 5 per cent. was found, and finally three routes, lying near together, which involved grades of $2\frac{1}{2}$ per cent., compensated for curvature. It is

probable, however, that even this grade may be modified by more extensive tunnelling.

On December 17, 1917, 737 m. were in operation in the United States and 234 m. in Mexico. The itineraries below cover the Mexican sections constructed.

The line as at present constructed is on a ruling grade of 2 per cent. which occurs in the section to Sanchez. East of Chihuahua ruling grade is $1\frac{1}{2}$ per cent. In the Topolobampo section it is 1 per cent. The gauge is 4 ft. $8\frac{1}{2}$ in. The railway is laid with 70 lb. rails over 630 m., 72 lb. rails over 9 m., and 75 lb. rails over 86 m. Sidings are laid with 60 lb. rails. The ties are mostly of white oak. In Mexico all important bridges are steel with concrete or masonry abutments.

The rolling-stock consists of 64 locomotives in the United States and 8 in Mexico, of Mogul and Consolidated types; 27 passenger cars in the United States and 10 in Mexico; and 1,800 freight cars in the United States and 247 in Mexico. The last are virtually all of 60,000 and 80,000 lb. capacity. The passenger locomotives are of 8-wheel type, with cylinders 19 to 26 in. and drivers 69 in. in diameter, total weight being 139,000 lb. Freight locomotives have cylinders 20 to 28 in. and drivers 63 in. in diameter, total weight being 168,000 lb. The equipment was built by the American Locomotive Company and American Car and Foundry Company.

miles con-
structed

0

Marquez, 3,306 ft., present starting point in Mexico. Between Marquez and Falomir line crosses the Rio Conchos at point where channel is about 650 ft. wide and 3 ft. deep at low water, by bridge of 17 spans of 50-ft. deck-plate girders, supported on plain concrete piers and reinforced concrete abutments, founded on rock, varying in depth below low water from zero at west side to 19 ft. on east side. 200 ft. of bridge extend over flat on east side of river. There is a grade of 1.5 per cent. for about 10 m. on each side of the river.

miles con-
structed

- 3 Falomir, 3,242 ft.
- 33 Encantada. In neighbourhood is mountain of almost pure iron.
- 71 Aldama, 4,170 ft. Here the Rio Chuviscar is crossed by a bridge of 10 spans.
- 91 Chihuahua, 4,605 ft. (see *Gazetteer of Towns*) junction with Mexican Central line (Section VI). From Chihuahua line runs generally W. through fine pastoral country over the Mexico North Western Railway (Section V) to Miñaca. This section contains grades of 2 per cent., compensated for curvature (0.07 deg. metric, about 0.04 per deg. 100 ft. chords) on the upward grades going W., and 1.8 per cent. on the upward grades going E. The longest stretch of 2 per cent. grade, with practically no break, occurs between San Andres and Aldana, about 10 m. Sharpest curves are about 470 ft. radius which are confined to the Aldana Cañon. All culverts are of masonry and all other openings are steel spans resting on masonry abutments, with the exception of the section close to the timber districts where there are a few wooden bridges. Steel bridges are of I-beams for the smaller openings, 2, 3, and 4 metres, and plate girders for the other openings up to 25 metres (82 ft.); standard lengths, which are invariably used, being 6, 8, 10, 12, 16, 20 and 25 metres. There are bridges with trusses over the Santa Isabel and Guerrero rivers and steel viaducts in the Aldana Cañon. All bridges were designed by the Pen-coy Steel Co. The track is laid with 60 lb. rails and hard pine ties, and the width of the roadbed is 1.41 ft. for the embankments and 19 ft. in the cuttings.
- 100 Fresno, 5,249 ft.
- 107 Salas, 5,570 ft. On descent to the Santa Isabel Valley there is heavy construction work.

miles con-
structed

- 124 Santa Isabel, 5,300 ft. Line crosses Rio Santa Isabel on bridge with trusses. Here line curves sharply N. to San Andres.
- 142 San Andres, 6,000 ft. Here line takes a general SW. course on an upward grade. There are two short tunnels in the cañon of the Santa Isabel just below San Andres.
- 158 Bustillos. Here line skirts S. shore of the Laguna de Castilla, 6,483 ft.
- 167 Aldana, 6,725 ft. Here is the cañon of Aldana, where there are four viaducts as follows :—
- | No. | | Length.
feet | Height.
feet | Alignment. | Grade.
per cent. |
|-------|---|-----------------|-----------------|------------|---------------------|
| No. 1 | . | 414 | 63 | Tangent | 2 |
| " 2 | . | 430 | 79 | " | 2 |
| " 3 | . | 506 | 69 | 12° curve | 1.44 |
| " 4 | . | 299 | 63 | " | 1.44 |
- 174 San Antonio, 6,750 ft. Beyond this station line enters foothills of a spur of the Sierra Madre and crosses for the first time the Continental Divide, E. of Pedernales.
- Branch line, ? 4 ft. 8½ in. gauge, over level plain to (10 m.) Huizochic, and (13 m.) Coshi-huiriachic, mining centre.*
- 189 Pedernales, 7,549 ft. Here the Sierra Madre describes a gigantic reverse curve, several hundred miles in length, from one slope of which the waters flow to the Atlantic and from the other to the Pacific. The grade here is 2 per cent. Line descends western slope of barrier to
- 205 La Junta, 6,758 ft., whence Mexican North-Western Railway continues to El Paso (Section V).
- 210 El Carpio. Here line crosses the Rio Guerrero on bridge with trusses.
- 211 Miñaca, 6,921 ft., on broad plain on the Pacific slopes of the Sierras, centre of mining district, the

miles constructed

whole neighbourhood being rich in minerals. Between Miñaca and Gonzales the Rio Guerrero is crossed by a bridge of 7 spans resting on stone piers, and the line enters the cañon of this river and runs generally SW.

220 Gonzales, 7,028 ft.

226 Terrero, 6,954 ft. Between Terrero and Verjel there is a bridge of 5 spans resting on stone and iron piers.

230 Verjel, 7,021 ft. Here is a bridge of 4 spans resting on stone piers.

234 Sigoyna, 7,139 ft. Between Sigoyna and Pichachic is a bridge of 3 spans, resting on stone piers and abutments, crossing the Pichachic river.

237 Pichachic, 7,225 ft. Line continues to rise and again crosses Continental Divide through difficult country.

261 La Laja, 7,920 ft. Here is a fall of 633 ft., in 7 miles, to

268 Bocoyna, 7,287 ft. In this region railway traverses fine timber-land, where saw-mills have been erected. Here the cañon of the Rio Bocoyna is entered and the river crossed.

272 Agnatos, 7,277 ft.

279 Creel, 7,693 ft.

285 Sanchez, 8,045 ft., present terminus of this section of the line. Here the Continental Divide is reached for the third time. Sanchez is about 75 m. from Chinipas, the centre of the Arteaga mining district, for which it forms one of the outlets, the other being Alamos (see p. 413). Beyond Sanchez the railway will proceed through Los Trigos; Mesa, 7,350 ft., near which is the Barranca de Cobre, a gigantic rift; and on a down grade dropping to 656 ft. at La Junta, 126 m. from Mesa; and thence to

miles
from Los
Hornillos

- | | |
|----|---|
| 0 | Los Hornillos, 547 ft. Line is constructed hence to Fuerte and Topolobampo but trains from Topolobampo do not proceed beyond Fuerte. Los Hornillos and La Cienga (7 m. E.) are the nearest points to Choix whence there are trails to the San Geronimo mine in the municipality of San Juan Nepomuceno, Mina district, Chihuahua State. |
| 11 | Fuerte, 328 ft., present terminus of section from Topolobampo. Line proceeds through the productive Fuerte river valley on a gentle gradient. |
| 35 | San Blas, 121 ft., junction with the Southern Pacific Railway (Section I). |
| 60 | Mochis Junction, 49 ft., where line enters the fertile Mochis valley. <i>Branch line</i> to (3 m.) Mochis, 50 ft. |
| 73 | Topolobampo, 10 ft.; port and Pacific terminus of railway. |

V.—(EL PASO) CIUDAD JUAREZ—CHIHUAHUA, 472 miles
(Mexico North-Western Rly.)

The Mexico North-Western Railway, with general offices in New York, was formerly the Rio Grande, Sierra Madre, and Pacific; the Chihuahua and Pacific; and the El Paso Southern railways. The route proceeds from Ciudad Juarez, and runs generally SW. and SE., with the Sierra Madre on the W., to Chihuahua. The section from La Junta to Chihuahua is used by the Kansas City, Mexico, and Orient Railway.

The line has been extensively damaged by revolutionaries. Passenger and freight traffic was resumed as far as Miñaca in September 1917, but a report of August 1918 indicated that through service was still impossible until 14 bridges south of Madera should be replaced.

The gauge is 4 ft. 8½ in.

The equipment on December 31, 1911, consisted of :

36 locomotives (including 26 freight locomotives), 30 passenger cars, 573 freight cars, 577 flat cars, 103 stock cars, 500 logging cars, 20 dump cars, 43 tank cars, 12 cabooses, 34 miscellaneous freight cars. A later account gives 23 locomotives, 28 coaches, and 1,451 wagons.

miles

- El Paso, junction, on Texas side of the Rio Grande, with the Atchison, Topeka, and Santa Fé, the El Paso and Southwestern, the Southern Pacific, and the Texas and Pacific Railways.
- 0 Ciudad Juarez (formerly Paso del Norte), 3,800 ft. (see *Gazetteer of Towns*), junction with the Central Railway to Chihuahua (Section VII). After crossing the Rio Grande line runs parallel with the National Railway for a short distance and continues in a general SW. direction and on an upward grade.
- 78 : Guzman. Near Guzman is the Bismarck mine. To the N. is the Laguna de Guzman, which receives the waters of the Rio de Casas Grandes : to the SE. is the Laguna de Santa Maria. Line now runs S. as far as San Pedro.
- 87 Urrutia, for the Lolita copper mines.
- 97 Sabinal, centre for the Aventurera and Grand Central mines. Also for the Progreso mines, in the Capulin Mountains, 15 m. W.
- 114 Empalme de San Pedro. *Branch line* to the mining centre of Candelaria.
- 117 San Pedro. Line now runs almost due W. to Corralitos (136 m.), whence it continues in a S. direction to Madera.
- 121 Summit, 3 m. distant are the Sierra Madre silver-lead mines.
- 148 Colonia Dublan. Mormon settlement.
- 150 Nuevas Casas Grandes, 5,200 ft., for the Fortuna and other mines, 20 m. distant. Near are the Mormon settlements known officially as Las Colonias de Galeana. Line crosses Rio de Casas Grandes.

- miles
- 168 Pearson, with lumber mills. S. of this point the railway enters an extensive district of timber lands owned by the company and S. of (221 m.) Chico as far as (341 m.) San Pablo the line skirts a great tract of leased timber lands lying to the W. of the line.
- 272 Madera, with lumber mills. Line now proceeds generally in a SE. direction.
- 305 Temosachic, on the Rio Papigochic which line now follows. Point of departure for the mining camps at Navidad, Concheño, Pinos Altos, and Ocampo (formerly Jesus Maria).
- 322 Tejolocachic.
- 358 La Junta. Hence the Kansas City, Mexico, and Orient Railway runs to Sanchez, through Miñaca (6 m.) (Section IV).
- For description of line to Chihuahua see Section IV (p. 420). This section is dealt with in that route in the reverse direction : the distances of the intervening points there given, by the present route, are ; (374 m.) Pedernales, (389 m.) San Antonio, (396 m.) Aldana, (405 m.) Bustillos, (421 m.) San Andres, (439 m.) Santa Isabel, (456 m.) Salas, (463 m.) Fresno.
- 472 Chihuahua, 4,605 ft. (see *Gazetteer of Towns*), junction with Constitutionalist Railways, etc.
- Branch line* (Chihuahua Mining Co.), 3 ft. gauge, to (13.6 m.) Santa Eulalia, where are the largest silver-lead mines in Mexico. From Santa Eulalia there is a line, 2 ft. 6 in. gauge, 18 m. long. This railway has an extremely sharp curvature and max. grade of 6 per cent. . The difference of elevation between mines and lower terminal is 1,500 ft., 22-ton locomotives are used, and train-load consists of 16 cars holding about 4 tons each. The Chihuahua Mining Co. hauls its own ore and that of the Potosi Mining Co. It also hauls ores from the Buena Tierra and Gasolina

miles

mines to Santa Eulalia. The San Toy mines send ore to Alberto (see p. 427).

Branch line, (F. C. Mineral de Chihuahua), 3 ft. gauge, to (3.1 m.) Tabalaopa, and (14.9 m.) Santa Eulalia.

VI.—(EL PASO) CIUDAD JUAREZ—MEXICO CITY, 1,224 miles
(Mexican Central Rly.)

The Mexican Central Railway was incorporated in 1880 under the laws of Massachusetts and in 1909 was taken over by the National Railways of Mexico. In September 1881 the section from Mexico to Tula was inaugurated and in 1882 the line reached Gueretaro and subsequently in the same year Lagos. On March 8, 1884, the main line was completed.

The gauge is 4 ft. 8½ in. At the close of 1908, 247 engines were burning oil and 150 m. of track were sprinkled with oil to lay the dust.

miles

—	El Paso (see p. 424). Line crosses the international boundary by bridge over the Rio Grande.
0	Ciudad Juarez, 3,800 ft. (see <i>Gazetteer of Towns</i>), junction with Mexico North-Western Railway to Chihuahua (Section V). Line parallels Mexico North-Western Railway as far as (11 m.) Mesa and runs almost due S. to Moctezuma, thence generally in a SE. direction.
81.2	Ahumada. S. of this station line crosses the Rio Carmen.
111.8	Moctezuma.
164.5	Laguna. W. of the line is a long narrow lake where the American Army encamped in 1847.
199.7	Terrazas.
225.3	Chihuahua, 4,605 ft. (see <i>Gazetteer of Towns</i>), junction with Kansas City, Mexico, and Orient Railway (Section IV) and Mexico North-Western

miles

Railway (Section V), centre of rich mining district; with smelters, foundry, and machine shops.

231·7 Alberto. *Branch line* (private), 4 ft. 8½ in. gauge, for the San Toy mines. From the mines there is an aerial tramway, 5 m. long to the terminus of this line. (For Santa Eulalia, see p. 425).

293·2 Armendariz. South of this station line crosses the Rio San Pedro.

315 La Cruz. Line describes wide curve and crosses the Rio Conchos on a six-span steel bridge.

325·7 Santa Rosalia, 4,086 ft. (see *Gazetteer of Towns*). Thirty m. W. is the irrigation scheme of the Mexican Northern Power Company (see p. 145). At Santa Rosalia is a bridge.

Branch line (F. C. Camargo y Oeste), for construction purposes only, from Santa Rosalia by San Francisco Conchos to (19·3 m.) Boquilla.

371 Jimenez, pop. 5,000. Here is a bridge which has been repaired (June 30, 1916).

Branch line, 4 ft. 8½ in. gauge, runs parallel with main line for short distance, crosses a long bridge, then continues in W direction through an agricultural and mining district to (36·6 m.) Morita. Line now enters hilly region crossed by numerous water-courses and runs to (51·5 m.) Maturana, and, on an upward grade, to (55·2 m.) Parral, or Hidalgo del Parral, 6,200 ft., (see *Gazetteer of Towns*). From Parral there is a line to Minas Nuevas, &c. (see below). Line continues to (62·3 m.) Zenzontle; (67 m.) Adrian (whence there is a branch, 5 m., to Santa Barbara, mining centre with large smelters and reduction works); (80 m.) Cuevas; and (95·9 m.) Rosario, mining town, present terminus, whence line is to be continued to the El Oro (8, 500 ft.) and Inde mining camps in Durango. From Rosario

miles

a wagon road runs to Carmen, 90 m. SE., and Guanacevi; and another to Inde, through Los Sauces. This road is continued to Zape. Five m. NW. of Guanacevi, which is an important mining centre, is San Pedro, where the Mexican Consolidated Mining and Smelting Co. has its mines and mill.

Branch line from Parral (F. C. Parral y Durango), 4 ft. 8½ in. gauge, to (3 m.) Cabadena, (5 m.) Rincon, and (7 m.) Minas Nuevas. Here is the *Veta Colorada*, a great mineral vein running for nearly 10 m. through the district.

Branch line from Minas Nuevas (main line of the F. C. Parral y Durango), 3 ft. gauge, to (2 m.) Rincon, (6 m.) Molino (whence there is a line, 2 ft. 7½ in. gauge, to Santa Barbara—see above), (22 m.) Aguacaliente, (36 m.) El Ojito, (44 m.) La Mesa de Sandia, and (58 m.) Paraje Seco. Line runs over steep grade from Parral range and rises rapidly from 6,500 ft. to about 7,000 ft.

Line continues S. over level country to Corralitos.

391.9

416.7

Escalon. *Branch line* (F. C. Mexicano del Norte, incorporated in 1890 in New York State; general offices, New York), 4 ft. 8½ in. gauge, in NE. direction to (30 m.) Carrillo, N. of the Laguna de la Paloma, and (78 m.) Sierra Mojada, mining region, especially for lead ore, in the State of Coahuila. The line runs through the camp (Veta Rica, San José, and San Salvador mines) on a horse-shoe curve from E. to SE.

436.9

Ceballos.

448.9

Yermo, 3,799 ft.

462.7

Conejos, 3,759 ft. *Branch line*, (F. C. Central de Durango), 4 ft. 8½ in. gauge, in SW. direction,

miles

to (12 m.) Santa Marina, (24 m.) Los Alamos, and (32 m.) Descubridora.

476·5 Peronal, 3,649 ft.

491·8 Bermejillo (formerly Mapimi), 3,750 ft., in the great Bolson de Mapimi, deepest depression on the line. *Branch line* (F. C. de Mapimi), 2 ft. 6 in. gauge, to (6 m.) La Zanja, and (15 m.) Mapimi, centre of fertile agricultural region and of silver-lead mining district, with large smelter. Point of departure for Peñoles, mining centre. From Mapimi a narrow-gauge railway runs on an ordinary surface road to (3½ m.) Cambia and thence on a rack-road system to (6 m.) Ojuela. Here are the Ojuela and San Ignacio mines, separated from the mines of the south camp (Socovon, San Judas, and Santa Rita) by a deep gorge over which is a suspension bridge with a span of 1,000 ft., 254 ft. high. Another line operated by a tail-rope system runs across the bridge.

Hence as far as Gomez Palacio line traverses fine agricultural country, producing corn and cotton under irrigation.

500·1 Brittingham. *Branch line*, ? 4 ft. 8½ in. gauge, to (1 m.) Aedo, and (6 m.) Dinamita, dynamite factory (see p. 141).

503·8 Noé, 3,660 ft.

515·2 Gomez Palacio, 3,723 ft. (see *Gazetteer of Towns*).
Branch line, electric traction, ? 4 ft. 8½ in. gauge, to (3·1 m.) Lerdo, whence there is a line, 4 ft. 8½ in. gauge, electric traction, to (7 m.) Torreon.

Mexican International to Monterey via Reata leaves main railway at this point (Section VIII).

518·2 Torreon, 3,790 ft. (see *Gazetteer of Towns*). Junction with the Mexican International Railway between

miles	
	Durango and Mondova and with the line to Monterey (see above and Section VIII). From Torreon there is a branch of the Constitutionalist Railways to Saltillo (Section VII) and branch line to Lerdo (see above). Constitutionalist Railways and Mexican International Railway use same station. As far as Zacatecas main line passes through valley of the Aguanaval, fertile cotton and corn district and now continues on an upward grade to the SW. to Picardias.
	<i>Branch line</i> to Tlahuailo (see p. 449).
544.3	Picardias. Line crosses the Rio Agua Naval and passes through the Cañon de Picardias, and runs in a SE. direction to (680 m.) Pachecho.
562.1	Jimulco, mining centre with deposits of Mexican onyx. Here is a guayule rubber factory.
566.4	Otto. <i>Branch line</i> , narrow gauge, to the copper mines in this district.
614.6	Symon. Fourteen m. W. is the mining camp of San Juan de Guadalupe.
635.2	Fuertes. Between this and Camacho line enters State of Zacatecas.
642.6	Camacho.
680	Pachecho. Line now runs SW.
700.5	La Colorada, 6,520 ft.
717.2	Cañitas. <i>Branch line</i> to Durango (see p. 450).
730.9	Gutierrez, point of departure for the mining districts of Sombrerete (7,344 ft.) and, 25 m. farther, Chalchihuites, both on the high road from Gutierrez to Durango. A railway is projected from Gutierrez to Chalchihuites. Line now runs SE.
749.7	Fresnillo, 7,000 ft. (see <i>Gazetteer of Towns</i>). Line continues on upward grade with descents by long curves into wide valleys to
785.5	Zacatecas (see <i>Gazetteer of Towns</i>). <i>Branch line</i> (F. C. Compañia Constructora Nacional Mexicana, now Constitutionalist Rail-

miles

ways), 3 ft. gauge, to (4·3 m.) Guadalupe, and (14·9 m.) Trancoso, for Ojo Caliente mining centre.

Between Zacatecas and Guadalupe (791·6 m.) there is a descent of 1,110 ft. in 3·1 m. Line descends valley, encircles Monte El Refugio, and continues in a SE. direction.

806·1 Palmira. In neighbourhood is mining camp of Minillas.

823·8 Soledad. Line now runs almost due S. as far as (900·3 m.) Santa Maria.

836·5 Rincon de Romos, or Victoria de Calpulapam, 4,635 ft.

Branch line, 4 ft. 8½ in. gauge, to (8·6 m.) Tepezala, important mining centre, near which line crosses the Rio San Pedro, and (10·5 m.) Cobre, near to the important mining district of Asientos de Ibarra. From Asientos there is a line to San Gil, on the railway to San Luis Potosi (see below).

852·3 Chicalote. Line crosses the Rio San Pedro at its confluence with the Rio Chicalote. This bridge which had steel trusses in a span of 144 ft. was destroyed and is being reconstructed with double culverts of masonry of 13·1 ft. in each arch.

Branch line, 4 ft. 8½ in. gauge, to the Fundicion Central Mexicana (3·2 m.).

860·5 Aguascalientes, 6,280 ft. (see *Gazetteer of Towns*). Here are the railway shops. The water-supply is pumped into two tanks with capacities of 100,000 gallons and 33,000 gallons and there is a reservoir of about 350,000,000 gallons capacity. In hammer and smith shop there is a 6,000 lb. steam hammer and a 1,500 lb. hammer. Rolling mill has 2,500 lb. hammer. Power-house contains three 250 h.p. Babcock and Wilcox wrought-steel sectional water-

miles

tube boilers, set on one and one-half batteries. Generating equipment consists of three 300 h.p. De Laval steam turbines. Dynamos are the double armature type built by the Milwaukee Electric Co. Traversing building is a 10-ton crane. Machine shops have 5-ton travelling cranes and two 60-ton 4-motor electric travelling cranes. Roundhouse has provision for 56 stalls. Chief tools are electrically operated.

Branch line, 4 ft. 8½ in. gauge, leaves main line at (9.3 m.) Chicalote, 6,000 ft. and takes NE. direction across rolling country on an upward grade as far as (51 m.) La Honda, 7,000 ft., highest point on line. At (31.6 m.) San Gil is a branch line, 3 ft. gauge, to the Santa Francesca mine at Asientos (see above), 7.4 m. in length. At m. 51.5 commences the downward grade. Before reaching (68.3 m.) Salinas de Peñon Blanco, 6,570 ft., line enters State of San Luis Potosi and takes a SE. direction. Here are numerous salt lagoons with a considerable salt industry. To SE. lie the gold and silver mines of Pinos, in the State of Zacatecas, and to NW. is the town of Ramos, where saltpetre is mined. At (76.7 m.) Yotol line again enters State of Zacatecas and at (95 m.) Tolosa, re-enters State of San Luis Potosi. N. of (107.8 m.) Arenal line reaches the Rio Arenal and follows the E. bank of that river which it crosses at Ahualulco, 6,233 ft. Line proceeds to (131.2 m.) Estanzuela, 6,180 ft. and (139.7 m.) San Luis Potosi (see p. 441), junction on the National Railway (Section VII), whence line is continued to Tampico (Section VII a).

Line proceeds on downward slope to the Lagos Valley.

- miles
- 873·9 Peñuelas. Line traverses region with many curves and railway cuts.
- 882 El Tigre. N. of this station line enters State of Jalisco and descends into an arid valley and crosses a deep gulch by a long steel bridge.
- 890·3 Encarnacion. Line now runs SE.
Tramway, 3 ft. 3 in. gauge, animal traction, connects town and station (1·3 m.).
- 900·3 Santa Maria, point of departure for San Juan de los Lagos, celebrated shrine, about 18 m. SW.
- 929 Lagos, 6,272 ft. (see *Gazetteer of Towns*).
- 946 Pedrito. Line now enters the State of Guanajuato and descends to the valley of Leon.
- 955·6 San Francisco del Rincon, pop. 7,000.
Tramway, 4ft. 8½ in. gauge, animal traction, to Purissima del Rincon, 3 m.
- 965·6 Leon, 5,683 ft. (see *Gazetteer of Towns*). Line crosses the Rio Turbio. In 1888 a flood on the Rio Gomez, a tributary of this river, caused enormous damage in the city. A heavy dyke of masonry has been erected to prevent a similar disaster. City lies 2 m. E. of railway and is connected by a tram line, 4ft. 8½ in. gauge.
- 980·3 Napoles, 6,000 ft. Three m. before this station line enters the Cañon de la Laja, 1½ m. long.
- 986·4 Silao, 6,069 ft. (see *Gazetteer of Towns*).
Branch line, 4ft. 8½ in. gauge, proceeds up narrow gorge (Cañon de Marfil), on a heavy grade (2·5 per cent.) with sharp curves (from 413 ft. to 98 ft.), to (11 m.) Marfil, and (15 m.) Guanajuato, 7,000 ft. (see *Gazetteer of Towns*).
 Line proceeds over level country to
- 1004·9 Irapuato, 5,800 ft. (see *Gazetteer of Towns*), junction on line to Guadalajara (Section XXIX). From Irapuato line proceeds on upward grade through

- miles
- fine agricultural country and then descends to the Rio Lerma.
- 1017·5 Salamanca, 5,646 ft. (see *Gazetteer of Towns*).
Branch line, ? 4 ft. 8½ in. gauge, from San Juan de la Vega (Gonzalez Junction), station on main National line to Mexico City (Section VII), to (8·6 m.) Marquez, (14·9 m.) Santa Cruz (see below), (24·2 m.) Cerro Gordo, (28·5 m.) Salamanca (see above), (42·2 m.) Valle de Santiago, pop. 15,000, and (49·7 m.) Jaral del Valle. Line traverses fine agricultural country watered by the Rio Lerma.
- 1031·4 Guaje.
- 1042·8 Celaya, 5,763 ft. (see *Gazetteer of Towns*), junction on the National Railway through Acambaro to Mexico City.
Tramway, 2 ft. gauge, animal traction, to (3·7 m.) Roque, whence there is a similar line to (2·4 m.) Yustis, whence there is a similar line to (0·6 m.) Plancarte, with similar line to Franco (3·1 m.) and (5·5 m. beyond) Santa Cruz (see above). From Roque there is a similar line to (3·1 m.) Plancarte.
- Line proceeds almost due E. as far as Queretaro and descends gentle gradient through fertile valley.
- 1051 Apaseo.
- 1071·5 Queretaro, 5,947 ft. (see *Gazetteer of Towns*). Junction on the National line to Mexico City, via Tlalnepantla (Section VII). City lies one m. SW. of station.
Tramway, 4 ft. 8½ in. gauge, animal traction, to (5 m.) San Pedro de la Cañada, for the cotton mills, Fabrica de Hercules (with private line, 1·2 m. in length, 4 ft. 8½ in. gauge). District is noted for orchards and market gardens.
Tramway, 4 ft. 8½ in. gauge, animal traction,

m es

to (7 m.) Pueblito, or San Francisco, with shrine of Nuestra Señora de Puebleto.

Tramway (private), 3 ft. gauge, animal traction, to the Hacienda de Jurica (10 m.).

Tramway (private), 3 ft. gauge, animal traction, to Lopo and Amascula (12·4 m.).

Line proceeds SE. at a little distance from the National Railway, as far as San Juan del Rio. From (1,074·3 m.) Hercules line ascends steadily to a height of 8,000 ft. near (1,129·7 m.) Polotitlan, whence it descends gradually to Tula. Beyond Queretaro line crosses the Rio Queretaro four times and passes through the Barranca de Saldarriaga.

1105·7 San Juan del Rio, 6,245 ft., pop. 10,000, with iron-ore deposits and marble quarries. Here line crossed the Rio San Juan on iron bridge, 149 ft. long, with masonry abutments, but this bridge was dynamited five times during the revolution and has been reconstructed with a central pier and two spans of 72 ft. each. Line has numerous sharp curves. In 10 m. to Cazadero there is an ascent of 1,485 ft.

1116 Palmillas, 7,368 ft.

1124 Cazadero. Line now enters the State of Hidalgo and then the State of Mexico, alternating between the two States.

Branch line (F. C. Cazadero á Solis: Compañia Agricola de la Torre), 2 ft. gauge, to (7·4 m.) Taxhie, (10·5 m.) Estancia, and (22·3 m.) Nado.

Line is to be continued to Solis, 13·6 m. SE.

1150·7 Leña, 8,237 ft.

1165 San Antonio. Line descends rapidly across several bridges and sharp curves to the valley of the Tula river.

1174·4 Tula, 6,766 ft., former Toltec capital.

Branch line, 4 ft. 8½ in. gauge, runs E. to (9·3 m.) Tlaxcoapan, where line crosses National

miles	
	Railway, (13.6 m.) Telepango, (26 m.) Temoaya, and (44.1 m.) Pachuca, capital of State of Hidalgo (see p. 459).
	Line crosses the Tula river on steel bridge with two spans of 52 ft. 4 in. each resting on wooden trestles (which is to be reconstructed as a masonry bridge), and ascends steep grade to
1185.3	El Salto, 7,206 ft. To the r. is the Cuautitlan river. Near here line enters the Tajo de Nochistongo, a great trench constructed between the years 1607 and 1789 to drain the Valley of Mexico. For about 3 m. line runs along the side of the excavation, which in places is about 200 ft. deep, at about 60 ft. above the bottom.
1190.9	Nochistongo, 7,500 ft.
1195.2	Huehuetoca, 7,526 ft. Here line crosses the National Railway.
1206.9	Cuautitlan, 7,506 ft., also station on the National Railway.
1211.1	Lecheria, 7,518 ft., junction on line from Mexico City to Telles and Pachuca (Section XIII). Also station on National Railway (see p. 444).
1216.4	Tlalnepantla, 7,520 ft., ditto.
1224.1	Mexico City, 7,466 ft. (see <i>Gazetteer of Towns</i>). Terminus is at the Estacion de Buena Vista.

VII.—LAREDO—MEXICO CITY, 802 miles (National Rlys.)

The present National Railways of Mexico were incorporated in 1907 under the laws of Mexico and now embrace several other systems, including the Interoceanic, Mexican Central, and International railways. The length of lines on June 30, 1914, was 6,468 m. of standard gauge and 387 m. of narrow gauge. For equipment see p.

The National Railway was promoted by those interested in the Denver and Rio Grande Railway, and other narrow-

gauge lines, and was at first constructed as a narrow-gauge railway. It was found desirable to adopt the standard gauge, and by the end of 1903 the work of widening the line from Laredo to Mexico City was completed. At the same time much of the railway was reconstructed by cutting out curves and driving tunnels, and at this time and subsequently many bridges were rebuilt.

The gauge on the present route is 4 ft. 8½ in.

miles

—	Laredo, State of Texas, 492 ft., pop. 20,000. Nearest coastal city is Corpus Christi (Texas), 162 m. by Texas-Mexican Railway. Trains leave station of International and Great Northern Railway and cross the Rio Grande (Rio Bravo del Norte) by a bridge, opened in 1911, built of concrete and consisting of six arches of 175 ft. each.
0	Nuevo Laredo, 457 ft. (see <i>Gazetteer of Towns</i>). Line runs SW. and follows closely the old San Antonio trail.
10	Sanchez.
19	Jarita, 675 ft. Line enters State of Nuevo Leon. <i>Branch line</i> , 4 ft. 8½ in. gauge, runs N. to (13 m.) Columbia, on the Rio Grande. It is reported that the rails of this line have been taken up and used elsewhere.
37	Camaron. Line crosses narrow creek flowing through a gorge which intersects the plain.
70	Lampazos, pop. 5,000. Town lies about one m. E. Line now runs almost due S. to Monterrey.
93	Golondrinas. <i>Branch line</i> , belonging to the Compañia Fundidora de Fierro y Acero de Monterrey, to (6·2 m.) Cerro del Carrizal, 4 ft. 8½ in. gauge.
107	Guadalupe. <i>Branch line</i> , belonging to the Compañia Minera El Carmen, to (13·4 m.) Minas Viejas, 2 ft. 3 in. (0·698 metre) gauge.
147	Salinas. Line crosses small river by steel bridge.
158	Topo. Line crosses Rio Salinas.

miles

167

Monterey (Monterrey), 1,764 ft. (see *Gazetteer of Towns*). Junction for the Matamoros branch of the National Railways (see below), the Mexican International Railway to Torreon and Durango (Section VIII) and to Piedras Negras (Section VIII), and the Mexican Central Railroad to Tampico (Section IX). The electric tramways (15.5 m.) are 4 ft. 8½ in. gauge.

Branch line, electric traction, 4 ft. 8½ in. gauge, to (4 m.) Topo Chico.

Branch line (F. C. Minero Mexicano), 3 ft. gauge, from Smelter No. 3 to the San Pedro mines (12.4 m.)

Branch lines within the works of the Compañía Fundidora de Ferro y Acero, 4 ft. 8½ in. gauge and 3 ft. gauge, 10 m. in length.

Branch line, within the works of the Cervceria Cuauhtemoc, electric traction, 4 ft. 8½ in. gauge, 2 m. in length.

Branch line to Matamoros. This railway is subject to floods. In 1909 over 100 m. of track and 18 bridges were washed away during the floods. Gauge 4 ft. 8½ in. ? Line leaves Monterey at (1.2 m.) Matamoros junction and proceeds E. to (47.8 m.) Ramones, thence generally NE. to the valley of the Rio Grande, at (112.4 m.) Camargo, which it follows in a SE. direction to Matamoros. Before reaching (83.2 m.) Aldamas station, 177 ft. (for Los Aldamos, formerly Villa de Hoyos, across the Rio San Juan), line crosses Rio San Juan and follows r. bank to (93.1 m.) Zacate, near which it enters the State of Tamaulipas. Line runs through (101.2 m.) Ochoa and again parallels Rio San Juan. From (112.4 m.) Camargo, line proceeds to (144.6 m.) Anzalduas, on the Rio Grande, and thence to (152.1 m.) Reynosa, on

miles

Rio Grande, and proceeds, some 10 m. S. of that river, to (204·9 m.) Matamoros (see *Gazetteer of Towns*). There is a bridge across the Rio Grande to Brownsville, Texas, which is served by the St. Louis, Brownsville, and Mexico Railway.

Main line now runs WNW. as far as

187 Garcia, where line approaches railway to Torreon (station at Garcia, see p. 449). Line runs through a winding cañon course and on a steep upward grade, generally in SW. direction, (entering the State of Coahuila near (202 m.) Rinconada), as far as Saltillo. Between Monterey and Saltillo line rises 3,465 ft. in 54 m., at an average rate of 64 ft. per mile; most of the rise is, however, concentrated in a short portion of the distance, on grades of $2\frac{1}{2}$ per cent.

233 Saltillo, 5,212 ft. (see *Gazetteer of Towns*). Junction for the Coahuila and Zacatecas Railway (see below) and for the Constitutionalist Railway from Torreon (see below).

Branch line (F. C. de Coahuila y Zacatecas—Constitutionalist Railways), 3 ft. gauge, runs generally in SW. direction. (11·1 m.) Encantada, line crosses railway to Torreon. (25 m.) Carneros, also station on National Railway. (67 m.) Avalos, junction for San Pedro de Ocampo (see below). Near here line enters State of Zacatecas. (78 m.) Concepcion del Oro, 25 m. E. of mining district of Mazapil.

Branch line (F. C. de Coahuila y Zacatecas) from Avalos (see above), 3 ft. gauge, to (3 m.) Bonanzas and (17 m.) San Pedro de Ocampo, mining centre.

Branch line (F. C. Coahuila y Pacifico—Constitutionalist Railways), 4 ft. $8\frac{1}{2}$ in. gauge, from Saltillo to Torreon, along the southern edge of the Laguna country. Line runs SW. to (14 m.)

miles

Encantada, where the National Railway and the F. C. de Coahuila y Zacatecas are crossed. Thence line runs generally due W. to Torreon. (28 m.) Derramadero, (42 m.) General Cepeda, (62 m.) Seguin, (100 m.) Parras (see *Gazetteer of Towns*), (146 m.) Viesca, with guayule rubber factory. At Viesca is a line, 2 ft. gauge, belonging to the Compañia Nacional Salinera de Viesca, animal traction, 6.4 m. in length. Here the F. C. de Hornos crosses line (see below). (155 m.) Hacienda Hornos, junction with the F. C. de Hornos, line runs S. of the Laguna de Parras. (190 m.) Torreon (see p. 429).

Branch line (F. C. de Hornos), 2 ft. gauge, leaves Alamito, crosses the F. C. Coahuila y Pacifico at Viesca, runs to (15 m.) Hacienda Hornos (junction on F. C. Coahuila y Pacifico), recrosses the F. C. Coahuila y Pacifico, and runs NW. to (19 m.) Saucillo and (32 m.) Hornos, 3,595 ft., junction on the International Railway (see p. 449). From Hornos there is a line (National Railway), 4 ft. 8½ in. gauge, to (8.6 m.) Santa Elena and (14.9 m.) San Pedro de la Laguna, 3,591 ft., station on line from Monterey to Torreon via Reata.

Branch line to Reata (Section VIII, p. 449).

Main line now proceeds SW. on stiff upward grade, with double curves, passing on r. the battlefield of Buena Vista (1847), to

- | | |
|-----|---|
| 257 | Carneros, 6,867 ft. Line now runs SE. to |
| 301 | La Ventura. There is a straight run, with practically no curves, for 130 m. to Moctezuma. |
| 314 | Lulu. S. of this station line enters State of San Luis Potosi and now runs generally due S. to San Luis Potosi. |
| 353 | Vanegas. Town lies about 9 m. SE. of station. |

miles

Branch line (National Railway), ? 4 ft. 8½ in. gauge, to (10 m.) San Isidro (whence there is a private line to Potrero for the mines at Catorce, alt. 9,075 ft.), (15·5 m.) Cedral, with silver reduction works, (23·6 m.) La Cibra, and (29·2 m.) Matehuala, 5,293 ft., pop. 11,000, important agricultural and mining centre.

Branch line (F. C. de Matehuala), 3 ft. gauge, from Matehuala to (4·9 m.) Santa Fe (whence there is a private line to Cobriza, 1·5 m.), (5·3 m.) Esmeralda (whence there is a private line to San Juan), (6·2 m.) Azul, and (9·3 m.) Dolores.

Branch line (private), 3 ft. gauge, from Matehuala to (6·7 m.) Mina de la Paz.

367 Catorce, 5,938 ft. (see *Gazetteer of Towns*). Town and silver mines lie about 8 m. E. of station.

383 (Tropic of Cancer), 6,132 ft.

409 Los Charcas. *Branch line* (F. C. Central de Potosi), 2 ft. 6 in. gauge, to (9 m.) Charcas, mining centre.

432 Moctezuma.

441 Enramada, for Arista, 5,413 ft., mining centre, formerly called Jagüey de los Reinos.

457 Pinto, 5,777 ft.

466 Peñasco, 5,888 ft.

475 San Luis Potosi, 6,123 ft. (see *Gazetteer of Towns*). Junction on line from Aguascalientes to Tampico (for first part see p. 432; for second part see p. 444). City tramways (Compañía de Tranvías de S. L. P.), 4 ft. 8½ in. gauge, electric traction, are 17½ m. in length. One branch runs to Tequisquiapam, near which (3 m.) is one of the largest smelters in Mexico. Behind this smelter is a large reservoir, with masonry dam 100 ft. high.

Branch line (F. C. Potosi y Rio Verde), 3 ft. gauge, runs SE. to (18 m.) La Morena, (36 m.)

miles

Cañon Verde, and (38 m.) Ahuacatal. At Santa Maria del Rio, 8,000 pop., centre of rich agricultural region, about 16 m. SE., is a 2-ft. gauge railway, steam and animal traction, 18 m. in length.

Branch line to Tampico (Section VII a).

Main line now runs SW. as far as (527 m.) San Felipe, through

484 La Pila, 6,085 ft.

493 Jesus Maria, 5,967 ft. *Tramway to the Hacienda Jesus Maria, 2 ft. gauge.*

499 Villa Reyes. Town, alt. 5,960 ft., lies 3 m. SE. of station. South of Villa Reyes line crosses into State of Guanajuato. About 28 m. E. lies Santa Maria del Rio (see above).

527 San Felipe. Shortly before this station line crosses a deep barranca and now bends SE.

557 Rincon. Town lies some distance to left of line.

Branch line, running NE. to (19.2 m.) Lourdes, (31.6 m.) San Luis de la Paz, with reduction works, point of departure for mining camp of Xichu (26 m.), and (37.2 m.) San Pedro de los Pozos, mining centre, with tramway, animal traction, 1 ft. 7½ in. gauge (0.5 metre) to the mines (2 m.).

560 Dolores Hidalgo, 6,214 ft. (see *Gazetteer of Towns*). Town is connected with station by tramway, 4 ft. 8½ in. gauge, 3 m. long. Here a river is crossed by a steel bridge.

583 San Miguel de Allende, 5,955 ft. (see *Gazetteer of Towns*). Line enters the valley of the Laja river and follows its curves into a fine cañon, 5½ m. long.

597 Rinconcillo, 5,934 ft.

606 Gonzalez Junction. Here the National line to Mexico City, via Acambaro, leaves the main railway (Section XI).

miles

Branch line to Valle de Santiago and Jaral
(See p. 434).

Line now runs almost due E. to Queretaro, with the Mexican Central Railway some distance away on the r. Line traverses one of the richest agricultural districts in the Republic.

634 Queretaro, 5,947 ft. (see *Gazetteer of Towns*).
Junction with the Central Mexican Railway.

Branch lines (see p. 434).

Line proceeds SE., through a cañon five miles long, on upward grade.

637 Hercules, with large cotton mills.

645 La Griega. Line enters upon upland plain comparatively level as far as

668 San Nicolas. Here upward grade becomes steeper, the country is broken, and there are many curves and cuts through the rock. To the N. of San Nicolas lies the district of Cadereyta and about 35 m. NE. of Cadereyta is San Juan Tetla, whence there is a line, 3 ft. gauge, 7 m. long, animal traction, to San Martin.

673 Bernal. Beyond this point line enters State of Hidalgo and passes through short tunnel. Line now crosses many gulleys.

692 Chone. Line crosses deep rift on steel bridge.

701 Huichapan. Line continues on upward grade with many curves.

721 Escandon, 7,700 ft. Downward grade.

730 Sayula. Beyond this station is a large horse-shoe curve.

739 Endo. Line proceeds on upward grade to the level of the Valley of Mexico, which is entered beyond.

748 Teocalco. Beyond this station line crosses Central Railway to Pachuca.

759 Apasco.

771 Huehuetoca (see p. 436). Also station on Mexican Central line, which this railway crosses.

miles	
782	Cuautitlan, 7,506 ft. Also station on Mexican Central line.
787	Lecheria, 7,518 ft. Also station on Mexican Central line. Junction on line from Mexico City to Telles and Pachuca (Section XIII). Hills close in and grade is heavy to the cutting, 1,148 ft. long, which leads to the Barrientos Tunnel, 735 ft. long, with double track through tunnel.
792	Tlalnepantla, 7,520 ft. Also station on Mexican Central line. <i>Branch line</i> (F. C. Monte Alto y Tlalnepantla) 3 ft. gauge, starts from Mexico City, (8 m.) Tlalnepantla, (19.2 m.) San Pedro Atzacapozaltongo, and (23 m.) Progreso Industrial.
797	Tacuba Junction. Junction on railway to Toluca (Section XI).
802	Mexico City (see <i>Gazetteer of Towns</i>).

VIIa.—SAN LUIS POTOSI—TAMPICO, 275.3 miles (Mexican Central Rly.)

This branch of the Central Railway is of 4 ft. 8½ in. gauge. Descent of line is gradual for 125 m. (about 2,000 ft.) but in the next 40 m. to Rascon the descent is 3,000 ft. There is a 3 per cent. grade for 27 m., with curves of 262 ft. radius. Country through which the line passes is comparatively barren but is the habitat of the ixtle plant, exported from Tampico.

miles	
0	San Luis Potosi, 6,123 ft. Line runs NE. to
18.9	La Tinaja. Line runs E. to
27.4	Corcovada. Line runs NE. to Villar.
37.1	Peotillos, 4,822 ft.
47	Villar, nearest point to Guadalcázar, about 15 m. NE., with mines of silver and quicksilver. Line runs generally in SE. direction, enters the valley of the Rio Verde near its head, and skirts its N. edge to

miles

- 63·7 Los Cerritos, 3,799 ft. Sulphur mines.
- 81·1 San Bartolo. *Branch line* runs SW. to (4·9 m.) Angostura, (20·2 m.) Sirio, and (24·2 m.) Rio Verde, 3,251 ft., pop. 10,000, important agricultural centre on l. bank of the Rio Verde. From Rio Verde there is a branch line, 3 ft. gauge, to San Pedro and (4 m.) Portezuelo.
- 93·8 Las Tablas, for Ciudad del Maiz, 4,232 ft., pop. 5,000, agricultural centre, 20 m. NW. From Las Tablas line passes between low and barren hills to Las Canoas.
- 117·1 Cardenas, 3,802 ft. Here are the repair shops. Rapid descent commences (2·5 per cent. grade) and line follows the Rio Tamasopo on a winding course through mountainous country.
- 131·3 Las Canoas, at the head of the Tamasopo Cañon.
- 144·4 El Cafetal, 4,921 ft., rich coffee centre.
- 147·7 Tamasopo. Here is the large sugar mill of the Tamasopo Sugar Company, with tramway, animal traction, 3 ft. gauge, 3 m. in length.
- 152·4 Tambaca.
- 158·4 Rascon. Line crosses the Rio Frio or Gallinas. The Rascon bridge has been damaged and rests temporarily on wooden trestles (June 30, 1916). Near Rascon is the sugar mill of the Rascon Improvement Company, with branch line, 3 ft. gauge, 10 m. in length. Line now runs NE. and then N. to the Rio Micos (173 m.) and then almost due S. to (184 m.) Los Platanos. This great curve is taken in order to avoid the Sierras San Dieguito and Abra de Caballeros which block the direct course of the railway,
- 184 Los Platanos. Here is a masonry bridge which is being reconstructed with metal girders. Line now proceeds ESE. to
- 188·8 Valles. Line crosses the Rio Tampaon, E. of Santa Rosa. This bridge with two spans of 147 ft.

miles	7 in. each was damaged during the revolution and a new bridge of equal span has been erected. Line passes through the Cañon of El Abra, where are the quarries that furnished the stone for port works at Tampico.
199·9	Taninul. About 15 m. E. lies Guerrero, on the Rio Tamuin, where there is a line, animal and steam traction, 2 ft. 5½ in. (0·75 metre) gauge, 7 m. long. The bridge at Taninul has been damaged and partly reconstructed. Line runs NE to
204·8	Las Palmas. Line proceeds on gradual descent, and crosses numerous waterways between the rivers Panuco and Tamesi, to Ebano.
210	Rodriguez. Here is a bridge, reconstructed with metal girders.
240·7	Ebano. Extensive oil works of the Mexican Petroleum Company. with branch railway, 4 ft. 8½ in. gauge, 5 m. long.
267·2	Tamos. Swing bridge over the mouth of the Tamesi at its confluence with the Panuco.
275·3	Tampico, port (see <i>Gazetteer of Towns</i>).

VIII.—(EAGLE PASS) PIEDRAS NEGRAS—DURANGO—TEPEHUANES, 683 miles (Mexican International Rly.)

The Mexican International Railroad Company, now forming part of the National system, was organized in 1882 under the laws of the State of Connecticut. The primary design was to connect Mexico and the United States and to provide an outlet on the Pacific coast at Mazatlan. The latter design has not yet been completed. The railway was started from Ciudad Porfirio Diaz (now Piedras Negras) in 1882 and six years later had reached Torreon whence it was extended to Durango in 1902 and in 1914 about 63 m. W. from Durango. The railway has been located as far as Mazatlan.

The International serves the coalfields of Coahuila, and the mineral traffic of the line is considerable and furnishes two-thirds of its revenue.

The gauge is 4 ft. 8½ in.

miles

— Eagle Pass, State of Texas, on l. bank of the Rio Grande, is reached by line from Spofford on the Galveston, Harrisburg, and San Antonio Railway (Sunset-Central lines). Nearest coastal points are Port Lavaca (327 m.), Corpus Christi (317 m.), Rockport (327 m.), and Galveston (332 m.). Line crosses Rio Grande by bridge, 1,800 ft. long, with 5 truss-spans of the Howe system.

0 Piedras Negras (Ciudad Porfirio Diaz), 918 ft. (see *Gazetteer of Towns*). Line traverses somewhat arid pastoral country in a SW. direction.

32·1 Allende, 1,229 ft., for Zaragoza, 1,771 ft., pop. 4,000, on Rio Fernando, about 12 m. NW.

Branch line runs through Morelos, Zaragoza, and Davila to (29 m.) Esmeralda (opened 1913). This line is to be continued to meet the Kansas City, Mexico, and Orient Railway.

At Zaragoza there is a tramway, 3 ft. gauge animal traction, 13 m. long, running to Allende (?)

41·4 Leona, 1,508 ft.

52·2 Peyotes, 1,613 ft.

72·4 Sabinas, 1,426 ft., on r. bank of Rio Sabinas. Line crosses Rio Sabinas by a large bridge with 10 spans of solid steel girders, each 81·6 ft. in length, carried on piers and abutments 30 ft. above water.

Branch line to (4·3 m.) Agujita, (6·8 m.) Cloete, and (11·8 m.) Rosita. From this line there are four other branches, serving the Sabinas coal area to the north of the river.

Branch line, 4 ft. 8½ in. gauge, running SE. to San Felipe, 1,026 ft., and (12·4 m.) Hondo,

miles

1,046 ft. There is a road from Sabinas to San Felipe and Hondo.

Branch line, 4 ft. 8½ in. gauge, running NW. to (10 m.) La Purisima.

73·4 Mezquite. *Branch line*, 4 ft. 8½ in. gauge, running W., 3·7 m. in length.

82·3 Soledad, 1,217 ft.

88·9 Barroteran, 1,394 ft. *Branch line* (F. C. Carbonifero de Coahuila—leased line), 4 ft. 8½ in. gauge, running NW. to (6·2 m.) Las Esperanzas (for the Esperanzas coal basin), (19·2 m.) Palau, and (25·4 m.) Santa Rosa de Muzquiz (formerly Villa de Santa Rosa), 1,850 ft., with two branch lines from Palau.

97·7 Aura, 1,486 ft.

123·2 Hermanas, 1,299 ft., for Abasolo (formerly San Vicente el Alto), on r. bank of the Rio de Nadadores, about 10 m. W. Line crosses the Rio de Nadadores¹ and runs SW. as far as

147·8 Monclova, 1,978 ft. (see *Gazetteer of Towns*).

Branch line, ? 4 ft. 8½ in. gauge, (continuation of route from Torreon to Paredon (via Saucedo) and thence via International line to Monclova—see below) leaves Monclova and runs due W. to (13 m.) Nadadores, and (42 m.) Il Cuatro Cienegas, 2,608 ft., for La Reforma and the mines of La Mula (46 m. farther).

Branch line (Panuco Mountains and Monclova Railroad, with head-quarters at San Antonio, Texas), 3 ft. gauge, runs SE. to (14·9 m.) Mojinás, (27·3 m.) La Mota, and (41·6 m.) Panuco.

Main line now runs on upward grade to

150·3 Castaño, 2,454 ft.

180 Baján, 2,765 ft. and

¹ This is probably the bridge over the Hermanas river, solid steel girders, five spans, with masonry piers and abutments, destroyed by revolutionaries.

miles

211·5

Reata, 2,952 ft., junction on line Saltillo-Paredon
Reata (see below).

Branch line, ? 4 ft. 8½ in. gauge, to (13 m.) Anhelo, (17 m.) Paredon, (53 m.) Ramos Arizpe, and (62 m.) Saltillo (see p. 439), crossing line Torreon-Gomez Palacio-Monterey at Ixtle Junction, S. of Anhelo.

Branch line, 4 ft. 8½ in. gauge, runs SE. to (13·1 m.) Anhelo, (16·3 m.) Paredon, (33 m.) Arista, (68·3 m.) Topo Chico, and (71·8 m.) Monterey (see p. 438).

Line now continues SW. through desolate hill-district, passing (222·9 m.) Treviño, 3,248 ft., and crosses line from Gomez Palacio to Monterey, north of

237·7

Sauceda, 3,270 ft. Line of the International Railway from this point runs between the F. C. Coahuila y Pacifico (on S.) and the Mexican Central from Gomez Palacio to Monterey (on N.) but does not appear to be used for traffic. Trains proceed over the latter railway, which runs due W., through

249·6

Hipolito.

286·6

Tizoc.

349·3

San Pedro, whence a line runs S. to Hornos (see p. 440).

372·9

Sacramento. *Branch line*. Near Sacramento branch line from Torreon to Tlahualilo crosses railway. Line leaves Torreon and runs to (4 m.) Matamoros (station on old International route), (28 m.) Hormiguero (near which is Sacramento), (46 m.) Horizonte, and (58 m.) Tlahualilo.

388

Gomez Palacio, 3,723 ft., (see *Gazetteer of Towns*).

391·6

Torreon, 3,790 ft. (see *Gazetteer of Towns*). Line now runs generally SW. to Durango.

440·7

Pedriceña, 4,291 ft. for Nazas quicksilver mines, 15 m. W. *Branch line*, 4 ft. 8½ in. gauge, to

miles

- (5·8 m.) Velardeña, with smelting works, for Cuencame, mining town about 10 m. SW.
- 456·6 Pasaje, 5,232 ft., for San Juan de Guadalupe, agricultural and mining town, about 8 m. W.
- 471 Yerbanis, 6,219 ft., for Peñon Blanco, about 15 m. NW.
- 500·8 Tapona, 6,501 ft.
- 513·9 San Gabriel, 6,433 ft., for San Juan del Rio, on the Rio San Juan, agricultural and mining centre, with mines at Panuco (to the S.), and Coneto (to the NW.), the latter about 30 m. N. of station.
- 548·7 Durango, 6,209 ft. (see *Gazetteer of Towns*).
Branch line, ? 4 ft. 8½ in. gauge, running SE. to (12 m.) Gavilan, (23 m.) Guadiana (50 m.). Parrilla, mining centre, (56 m.) Muleros, (64 m.) Suchil and (82 m.) Mena. This line was in operation in 1913. From Mena the line has been continued through the Sombrerete mining district (see p. 430) to Cañitas, a station on the main line of the Mexican Central Railway (see p. 430) and this section was reported to be in operation on June 1, 1917.
- Line now runs in a NW. direction to
- 585·7 Canatlan.
- 630·3 Chinacates, for the Inde and El Oro mining districts, about 70 m. N., and for San Miguel Papasquiario, silver mining district, about 5 m. S. of railway. Line now runs SW. to
- 647·3 Descanso, whence general direction is again NW.
- 651·4 Santiago Papasquiario, centre of important agricultural district.
- 683 Tepehuanes, present terminus of line and point of departure for the Guanacevi mining camp, via Zape, about 60 m. N.

IX.—MONTEREY—TAMPICO, 322 miles (Mexican Central Rly.)

This line, formerly known as the Monterey and Mexican Gulf Railway, traverses a rolling country, deficient in rainfall, which slopes gradually towards the coast. The gauge is 4 ft. 8½ in., the max. grade is 1·5 per cent., and the least radius of curvature is 610 ft.

miles	
0	Monterey, 1,764 ft. (see <i>Gazetteer of Towns</i>). Line proceeds almost due W. to
33	San Juan. Line crosses Rio San Juan on bridge, damaged during the revolution, and now runs due S. to
57	Montemorelos, 1,383 ft., pop. 5,000, on the Rio Pilon, which line crosses on bridge, damaged during the revolution. Important agricultural centre. Line now runs generally SSE.
91	Linares, 1,187 ft., pop. 8,000, agricultural and mining centre. Here is a bridge, damaged during the revolution. <i>Branch line</i> (private), 4 ft. 8½ in. gauge, runs SE. to the mining camp of San José (38 m.), 2,398 ft., crossing numerous small waterways. From San José there is a tramway, animal traction, 1 ft. 5½ in. (0·457 metre) gauge, to the copper mines at San Carlos, 1,417 ft., 5 m. beyond.
102	Benitez. Here line enters State of Tamaulipas.
118	Garza Valdez, 1,112 ft. Line crosses Rio Pilon on bridge, damaged during the revolution.
124	Piedra, 951 ft., for the mining centre of Villegran (formerly Real de Bourbon) 12 m. W. Line crosses Rio Santa Lucia S. of Piedra.
129	Carrizos, 836 ft. N. of Carrizos line crosses the Arroyo Meco.

miles	
141	Tinajas, 754 ft. N. of Tinajas line crosses the Arroyo Salitre.
149	Cruz, 787 ft. Here line crosses the Rio Santander or Purificacion on bridge 797 ft. long, damaged during the revolution.
156	Santa Engracia, 698 ft. Line crosses the Rio Santa Engracia on bridge, damaged during the revolution.
	<i>Branch line</i> , 1 ft. 5½ in. (0.450 metres), animal traction, to (5.5 m.) Hacienda de Santa Engracia, 1,328 ft.
164	Carbonero, 787 ft.
168	Caballeros, 836 ft.
176	Ciudad Victoria, 990 ft. (see <i>Gazetteer of Towns</i>). Here is a bridge, damaged during the revolution.
	<i>Tramway</i> , 3 ft. gauge, animal traction, to (2 m.) Hacienda de Tamatan.
186	Rosa, 931 ft.
197	Lavin. Oil seepages occur here.
207	San Francisco, 590 ft. Line crosses the Arroyo Carabina.
218	Forlon, 672 ft., for Ciudad Bernal del Forlon. From Forlon to Escandon line follows l. bank of the Rio Guayalejo, crossing numerous small tributaries.
231	Escandon, 544 ft., for Xicotencatl on the Rio Guayalejo, about 20 m. SW.
249	Rosillo, 360 ft., for Magiscatzin on the Rio Guayalejo, about 13 m. SW. Here line crosses the Arroyo Naranjal.
290	Los Esteros, 98 ft. Here line reaches the lagoons of the Rio Tamesi and, keeping to the north of these, proceeds to
306	Altamira, and
322	Tampico (see <i>Gazetteer of Towns</i>).

IXa.—TAMPICO—LA BARRA, 6·1 miles

Between Tampico town and La Barra at the mouth of the Panuco River (N. side) there are (a) a line of the Mexican Central Railway and (b) an electric tramway. The railway runs as follows :

miles		miles	
0	Tampico.	3·8	Talleres.
1	Iturbide.	4·8	El Aguila.
1·9	Huasteca.	5·4	Varadero.
2·8	Arbol Grande.	6	Hospital.
3·3	Doña Cecilia.	6·1	La Barra.

IXb.—TAMPICO—PANUCO, AND PROJECTED ROUTES FROM TAMPICO

The Tampico-Panuco Valley Railway runs SW. from a point on S. side of the Panuco river opposite Tampico, through the Topila oil field, and is intended to be carried to El Higo on the upper Panuco, through other oil properties. At present the line has been constructed for 39 m. and the railway bridge—a steel suspension drawbridge—across the Rio Panuco, which is also to be used by the projected line to Mexico City, has been partly constructed. The line is of 4 ft. 8½ in. gauge and the rolling-stock consists of five locomotives (two of 75 tons, one of 40 tons, one of 30 tons, and one of 20 tons), 3 closed cars for merchandise, 3 cattle trucks, 10 oil tank cars, 2 track automobiles, 20 flat cars (with 25 others on order), and 1 steam shovel.

Another line from Vera Cruz to Tampico has been authorised and a line northward to Matamoros and San Antonio (Texas) has also been projected and the preliminary survey made. This line is to follow the railway to Monterey as far as Gonzalez whence it will run through Sota la Marina and San Fernando, opening up agricultural and oil lands.

For the line Pachuca-Tampico, see Section X.

X.—PACHUCA-IXMIQUILPAN, 51 miles (F. C. Pachuca à Tampico)

miles	
0	Pachuca (see <i>Gazetteer of Towns</i>). Line, ? 4ft. 8½ in. gauge, runs NW. as far as Ixmiquilpan.
10	Tornacuxtla.
18·6	Frailes.
26·7	Actopan.
51·5	Ixmiquilpan. Town is situated some distance from station at the confluence of the rivers Tula and Ixmiquilpan. Hence line will proceed NE. to Zacualtipan and thence to Tampico. Ixmiquilpan is the nearest point for the Zimapan and Jacala mining centres; In the former district are the iron deposits at Encarnacion, where there is a tramway, 2 ft. gauge, animal traction, 2·5 m. in length, to the El Dulce Nombre mine, and a similar line 15·5 m. in length to Monte Pinal Alto.

XI.—GONZALEZ JUNCTION—MEXICO CITY, 231 miles (National Rly.)

The gauge of this branch of the National Railway is 4 ft. 8½ in. as far as Tultenango and 3 ft. beyond. For the section between Saltillo and Gonzalez Junction see Section VII.

miles	
0	Gonzalez Junction, 5,840 ft. Here National Railway divides into two sections. For route to Mexico City via Queretaro see p. 442. Line proceeds over fairly level country crossed by numerous streams and irrigation ditches and runs SW. to Celaya. Beyond Soria line crosses Rio de la Laja by bridge 374 ft. long.
9	Santa Rita, 5,780 ft.
12	Celaya, 5,763 ft. (see <i>Gazetteer of Towns</i>), junction on Central Railway (see p. 434). Between Celaya

miles

and Tamayo line crosses the Rio Laja on a steel bridge.

18 Tamayo.

26 Calacote. Line curves to W.

34 Corral, for Tarimoro.

36 Salvatierra, 5,736 ft. (see *Gazetteer of Towns*). Line now runs SW. on upward grade.

47 San Cristobal, 6,020 ft. Line emerges on broad upland plain.

50 Betti. Line curves to S. and crosses Rio Lerma on steel bridge, 147 ft. long.

54 Acambaro (see *Gazetteer of Towns*).

Branch line to Uruapan (Section XII).

Line now runs NE. to Zirizicuaró.

68 San José, 6,154 ft.

71 Tarandacuaro, 6,260 ft. *Branch line* here, or near here, (F. C. de Acambaro á Queretaro) runs to (4.3 m.) Jaral, (9.9 m.) Angistonos, and (27.3 m.) Jerecuaro.

79 Zirizicuaró, 6,560 ft. Line runs SE., skirting the brink of a deep gorge.

92 Maravatio, 6,577 ft.

Branch line (Michoacan and Pacific Railway—leased line), 3 ft. gauge, runs generally S., through (14 m.) Irímbo, (27 m.) La Junta (with branch to Angangueo, 7,000 pop., silver mining centre, 2 m.), (30 m.) Ocampo, (40 m.) Sirahuato, and (53 m.) Zitacuaro (see *Gazetteer of Towns*). From Zitacuaro a line (F. C. Zitacuaro á Jocónusco), 3 ft. gauge, runs E. to Carolinas, Silva, and (10 m.) Joconusco.

Line now runs E. to

115 Tepetongo, 7,578 ft. Beyond this station line enters State of Mexico.

122 Solís, 7,906 ft. Line now describes a series of double horse-shoe curves and proceeds through the

miles	Cañon del Zopilote, about one m. long, where line is 196 ft. above bottom of barranca. Line now enters the Valley of Maravatio.
130	Tultenango, 8,310 ft. <i>Branch line</i> (F. C. Minero de El Oro), 3 ft. gauge, runs S. to (7 m.) El Oro (see <i>Gazetteer of Towns</i>), for the important mines (9,500 ft.). Here (in 1909) 13 electric locomotives were in use, the largest being 30 tons, over a 3·8 per cent. grade. Line continues to (12 m.) La Cima, (15 m.) Los Medanos, (25 m.) La Trinidad, and (30 m.) Yondese, with supplies of timber. From Yondese there is a line (F. C. de Yondese á Toluca), 3 ft. gauge, running 7·4 m. S.E. Line, now on 3 ft. gauge, runs S.E. as far as Toluca.
134	Venta del Aire, for Atlacomulco. <i>Branch line</i> , narrow gauge, to the Hacienda del Mayorazgo, 8 m.
145	Flor de Maria Maxdapui, 8,228 ft., for San Felipe del Progreso. In the Municipality of San Felipe is the Hacienda de San Onofre, with a line, 3 ft. gauge, steam traction, 10·5 m. long.
161·8	Ixtlahuaca, 8,323 ft. Town lies about one mile from station. At m. 157·3 is a tunnel, 410 ft. long, entered by a cut 72 ft. deep. <i>Branch line</i> (F. C. de Ixtlahuaca), 3 ft. gauge, runs N.E. to (8·6 m.) Mostege, (11·1 m.) Mañi (Near here there is a small branch line, 3 ft. gauge, 4 m. long, serving various haciendas), (21·7 m.) La Garita or Nijini, and (27·9 m.) Presa Grande.
171	Del Rio, 8,336 ft. Line proceeds across numerous arroyos and over broad plain intersected by hills and valleys to
186	Toluca, 8,761 ft. (see <i>Gazetteer of Towns</i>). <i>Branch line</i> (F. C. Toluca á Tenango y San Juan), 3 ft. gauge, runs S.E. to (8 m.) Mexicalcingo, (11 m.) Calimaya, and (15·4 m.) Tenango,

miles

5,000 pop., for the mining regions around Saulteppec and Zacaupan. From Tenango there is a line (F. C. Tenango á Santa Maria), 3 ft. gauge, to (3·3 m.) Atla.

Branch line (F. C. de Toluca á Tenango y San Juan), 3 ft. gauge, runs W. to (5 m.) Zinacaul-tepec and (10 m.) San Juan de las Huertas.

Line now runs E. and NE. to Mexico City.

192 Lerma, 8,454 ft. Line crosses marshy tract intersected by canals and then proceeds on heavy upward grades.

199 Jajalpa, 8,887 ft. Here is a cutting through rock, and a viaduct. Between Jajalpa and Salazar line crosses the Horno Viejo viaduct, 301 ft. long and 105 ft. high.

201·4 Fresno. Here line passes over arched tunnel, 13 ft. deep, through which flow the waters of the Barranca del Fresno.

205·2 Salazar, 9,812 ft.

206·5 La Cima, 9,976 ft. Highest point on line—La Cumbre de las Cruces.

208·3 San Martin. Beyond this station is a tunnel, 669 ft. long.

210·8 Laurel. Beyond this station is the Laurel viaduct, iron, with 7 spans of 39 ft. 4 in. each, built on a curve. Half a mile beyond is the San Fransquito viaduct, iron, with 14 spans of 32 ft. 9 in. each.

213·9 Dos Rios, 8,644 ft. Beyond this station is an iron bridge, 182 ft. long and 68 ft. high and about 1 m. farther an embankment 787 ft. long and 79 ft. high. Line descends 1,000 ft. in 9 m.

223 Rio Hondo, 7,553 ft. Before reaching this station is an iron girder bridge, 60 ft. high.

225 San Bartolo Naucalpan, 7,437 ft.

228 Tacuba Junction.

231 Mexico City, 7,466 ft. (see *Gazetteer of Towns*).

XII.—ACAMBARO-URUAPAN, 143 miles (National Rly.)

miles

- 0 Acambaro (see *Gazetteer of Towns*). This branch of the National Railway is 4 ft. 8½ in. gauge. Line follows valley of the Rio Lerma through fertile country.
- 6·8 Costura. Near here line enters State of Michoacan and traverses a wild gorge, called Escape de la Cumbre, where there are numerous cuttings and terraces. Line runs on downward grade with Lake Cuitzeo on r.
- 19 Andocutin. Line skirts shore of lake for several miles.
- 23 Huingo, 5,601 ft. To SE. lies Zinapecuaro, 3,500 pop. Line crosses region devoted to production of salt.
Branch line (private) to the Hacienda San Joaquim Jaripeo, (14·9 m.), used for conveying timber. Gauge 4 ft. From the Hacienda there are branch lines with gauge of 2 ft. The grade is 5 per cent. and there are numerous bridges and trestles of timber construction. Locomotives are of 40 h.p. and 50 h.p. for the main line and 20 h.p. for the branches.
- 31 Querendaro, 5,997 ft.
Tramway (private), animal traction, 2 ft. gauge, 8·6 m. in length.
- 39 Quirio, 6,055 ft.
- 41·6 Charo, 6,095 ft. Hence, through (48 m.) La Goleta, to Morelia grade is upward with numerous curves.
- 57 Morelia, 6,200 ft. (see *Gazetteer of Towns*). Line ascends through valley and runs SE., following terraces cut from the hills and passing through the Coincho Cañon on upward grade. At end of this cañon line crosses Rio Santiago on iron bridge 56 ft. above stream.

miles	
70	Jacuaro, centre for numerous haciendas. Line now slopes downwards and runs W. to Patzcuaro, crossing a bridge, 223 ft. long.
95	Patzcuaro, 7,180 ft. (see <i>Gazetteer of Towns</i>). Line follows shore of lake and tends SW. on downward grade from Ajuno.
106	Ajuno. To this point a line is being constructed from Penjamo, a station on the line from Iraputo to San Marcos (Section XXIX).
107·4	Ajambaran. Line descends by a series of five curves one above another to
115·5	Tarascon. Line now runs NW. through fine fruit district to
120·5	Las Palomas. Line runs W. to
143	Uruapan, 5,576 ft. (see <i>Gazetteer of Towns</i>). Five hours' journey across the mountains to the NW. lies Los Reyes (Section XXIX) on the Zamora branch of the Central Railway.

XIII.—MEXICO CITY—PACHUCA

There are three routes from Mexico City to Pachuca. (A) The first (Central Railway) is from the Buena Vista Station, through Lecheria and Telles. (B) The second (F.C. Hidalgo y Nordeste, operated by National Railway) is from Peralvillo Station and runs via Tepa. The third is via Ometusco on the Mexican Railway (Section XXIII).

miles	
	(A)
0	Mexico City, 7,466 ft. Line, 4 ft. 8½ in gauge, leaves Buena Vista Station and proceeds through Tlalnepantla to
14	Lecheria, 7,518 ft., junction on main Central line (see p. 436). Here line to Pachuca proceeds NE.
20	Tultepec. Line runs between Lakes Xaltocan and

miles

Zumpango. At (23 m.) Cajiga is a bridge, dynamited and repaired.

51 Telles. *Branch line* to Honey, Tortugas, &c. (Section XV).

52·8 Mathilde.

55·9 Pitahaya.

57·1 Hoyos.

67·1 Pachuca, 7,824 ft. (see *Gazetteer of Towns*). There is a system of steam and mule tramways, 3 ft. gauge, 17 m. in length.

(B)

0 Mexico City, 7,466 ft. Line (F. C. Hidalgo y Nordeste), 3 ft. gauge, leaves the Peralvillo Station and runs generally NE. to Tepa and thence N. to Pachuca, crossing the Mexican Railway and crossing and re-crossing the Mexican Central line to Pachuca (see above).

12 Gran Canal. *Branch line* (F. C. del Desague del Valle de Mexico), 3 ft. gauge, runs N. to (1·8 m.) San Cristobal (also station on Mexican Railway) crossing the Central line to Pachuca at m. 14·2 and running E. of Lake Xaltocan, (13 m.) San Andres, (18·6) Zumpango, and (23·6 m.) El Tajo de Tequixquiac, 6 m. NE. of Huehuetoca (Section VII, p. 443).

22 Santa Ana.

32 Tizayuca.

42 Tezontepec.

48 San Augustin. *Branch line*, 3 ft. gauge, from Tepa (see below) to (4 m.) San Augustin, (13 m.) Tlanalapa, (19 m.) Amaninalco (whence there is a private line, 3 ft. gauge, animal traction, 8 m. long, to the Hacienda de Guadalupe), (22 m.) Irolo, junction on Mexican Railway (see p. 482), and (28 m.) San Lorenzo, junction on Interoceanic Railway (see p. 466)

miles	
52	Tepa (see above). <i>Branch line</i> to Beristain, &c., (Section XIV). <i>Tramway</i> (private), 3 ft. gauge, animal traction, to (1 m). Hacienda Tepa el Chico.
58	Xochihuacan.
68	Pachuca, 7,824 ft.

XIV.—TEPA-BERISTAIN-HUAUCHINANGO, 67·7 miles (Hidalgo and North-Eastern Rly.)

This railway, forming part of the Hidalgo and North-Eastern Railway, is of 3 ft. gauge.

miles	
0	Tepa, junction on F. C. Hidalgo y Nordeste from Mexico City to Pachuca (Section XIII). Line runs generally E.
5	Tecajate.
13	Somorriél.
23·6	Los Romeros. <i>Tramway</i> , 3 ft. gauge, animal traction, to (6·8 m.) Hacienda Cuyuac.
29·2	Ventoquipa. <i>Branch line</i> to (5 m.) Tulancingo, on line Telles-Honey (see p. 462), (10 m.) Sototlan, and (21 m.) Tortugas (near Apulco, see p. 462), important iron centre.
32·3	Equia.
46·6	Ahuazotepec.
50·3	Beristain. From this point a line has been constructed to Huauchinango. This line belongs to the Empresa de Luz y Fuerza de Necaxa. The max. grade is 8 per cent. and Porter and Shay triple expansion engines are used.
67·7	Huauchinango, 4,828 ft. Near are the falls of Necaxa (see p. 142).

XV.—TELLES-HONEY, 60 miles (National Rlys.)

This railway forms part of the National system and is of 4 ft. 8½ in. gauge.

miles	
0	Telles, junction on Central line from Mexico City to Pachuca (Section XIII). Line runs generally E., crossing the F. C. Hidalgo y Nordeste and the Mexican line to Pachuca.
6	Sandoval.
9	Metepec.
14	Zontecomate.
37	Tepenasco. <i>Branch line</i> , runs NE. to (6·2 m.) Perez, and (15·5 m.) Apulco, important iron centre.
41	Tulancingo, 6,840 ft. (see <i>Gazetteer of Towns</i>). Here the branch line from Ventoquipa (Section XIV) crosses railway. ? Junction.
52	Panfilo.
60	Honey.

XVI.—VERA CRUZ-JALAPA-ORIENTAL-SAN LORENZO-MEXICO CITY, 293·7 miles (Interoceanic Rly.)

The Interoceanic Railway was formed from a number of subsidiary concerns such as the F. C. de Irolo, extending from Mexico City to Irolo, and later to Iturbe; the Puebla to San Martin tram line; and the tram line from Puebla to San Juan de los Llanos, via San Marcos and Virreyes. It was registered in London in 1888 as the Interoceanic Railway of Mexico (Acapulco to Vera Cruz). Since 1904 the lines have been operated by the National Railway Company.

In 1907 there was a 3 per cent. grade on 73 miles of the line and the radius of the heaviest curves was 262 ft. The Jalapa line was laid on a 3 ft. gauge, but the roadbeds were taken as 14 ft. and 18 ft. The ties were only 7 ft. long and this was the only item originally estimated lower on account of

the narrow gauge. The average cost of the heavy grades was about £8,000 per mile.

Much of the line has been reconstructed since the original location was made and heavy grades and curves have been greatly reduced.

The route to Puebla was opened in 1891, when the line to Mexico City was 339 m. long. In 1905 the cut-off between San Lorenzo and Oriental (see p. 467) reduced the journey to 293 m. as compared with 264 m. via the Mexican Railway.

The Interoceanic Railway has been greatly damaged during the revolutionary disturbances, the permanent way has deteriorated, locomotives and wagons have been destroyed or damaged, and some stations and bridges (such as the bridge at San Francisco) have been destroyed. In September 1916 communication between Vera Cruz and Mexico City was resumed.

Before the Revolution about 60 per cent. of the freight from Vera Cruz to the plateau passed over the line.

Since August 1914 the railway has been out of the directors' hands and now forms part of the so-called Constitutionalist Railways.

In 1903 the Interoceanic Railway leased the property of the Mexican Eastern Railway (San Marcos to Teziutlan) and in 1910 the lines of the Mexican Southern Railway were taken over.

In 1914 the Company owned 75 locomotives, 91 passenger cars, and 1,126 freight wagons. In addition there were 7 locomotives, 4 passenger cars, and 108 freight wagons belonging to the Mexican Eastern Railway; and 25 locomotives, 41 passenger cars, and 262 freight wagons belonging to the Mexican Southern Railway. Oil fuel is burnt on the engines.

The length of the lines owned and leased was as follows :

Interoceanic Railway	.	.	.	594 m.
Mexican Eastern Railway	.	.	.	140 „
Mexican Southern Railway	.	.	.	313 „
				<hr/>
				1,047 „

Gauge, 3 ft.

miles

- 0 Vera Cruz (see *Gazetteer of Towns*). Line proceeds due S. to
- 7.4 Buenavista, and thence NW. to
- 11.8 Santa Fe. Line now runs almost due N. to the crossing of the Rio S. Juan, whence it runs parallel with the r. bank of the Rio Antigua.
- Branch line* (private), steam traction, 3 ft. gauge, to La Candelaria, San Miguel, and (17.3 m.) San Antonio.
- 27.3 San Francisco. Near here line crosses the Rio Antigua by a temporary bridge, erected to replace the former steel bridge, resting on stone piers, which was destroyed in April 1914. This structure was replaced by a wooden bridge which was carried away by a flood in 1915. The location was then changed, a new grade to replace the former heavy one of 2.5 per cent. was studied, and a provisional bridge on a compensated grade of 1.3 per cent. was erected at Salmoral, near m. 24.8. The permanent bridge to replace this structure is to have two principal spans of 147 ft. each. Line now runs in W. direction, parallel with l. bank of the Rio Antigua and the old high road to Mexico City, which is crossed at Rinconada, through Tamarindo, near the Puente Nacional 636 ft.
- 41 Rinconada, 1,026 ft. Near here line crosses divide between waters of the Rio Antigua and Rio Juan Angel.
- 50.9 Colorado. Beyond this point line follows course of the Arroyo Paso Buey, tributary of the Rio Pescado, in a general NW. direction to the neighbourhood of
- 67.1 Chavarrillo, 3,103 ft., and continues in same direction on a 3 per cent. grade to
- 80.7 Jalapa, 4,681 ft. (see *Gazetteer of Towns*).
- Branch line* (F. C. Jalapa á Teocelo), 3 ft. gauge, to (7.4 m.) Coatepec, 4,107 ft. ; (13.6 m.)

miles

Xixo, where are the falls (256 ft.) whence Jalapa and Coatepec receive electricity (power plant, 1,700 horse-power); and (18.6 m.) Teocelo, 3,978 ft. Two locomotives, 9 coaches, and 12 wagons.

From Coatepec there are two private lines, animal traction, 2 ft. gauge, to the Hacienda de Zumpizahua (5.5 m.) and the Hacienda de Tuzamapan (5 m.) respectively.

From Jalapa line proceeds through country, broken into deep ravines, necessitating sharp curves and heavy grades. In 61 m. the line now rises 3,406 ft. Between Dehesa (93 m.) and San Miguel del Soldado (96.8 m.), after emerging from a tunnel, line crosses a deep chasm.

106.2 Cruz Verde, 6,814 ft.

116 Las Vigas, 8,140 ft. In this neighbourhood line after passing over rough country reaches the edge of the great plateau at La Cima. Here between Rubin (125.4 m.) and Limon (136.6 m.) there was formerly a descending grade of 0.73, and west of Rio Frio there was a succession of grades of 2.5 per cent. A revision of this section has reduced the grade to a supported 0.35 with a min. curve of 1,910 ft. radius.

128.3 Perote, 7,853 ft.

158.3 Oriental, 7,693 ft., important junction on the Inter-oceanic line to Puebla (Section XVII).

Branch line (Mexican Eastern Railway), 3 ft. gauge, to (12.4) Concepcion, whence is a line to Libres (see below), (23.6 m.) Huitzitzilapam, (32.3 m.) Zaragoza and (52 m.) Teziutlan, 5,200 ft. (see *Gazetteer of Towns*). From the smelting works at Teziutlan there is a cable tramway (Leschen automatic, with 34 steel towers), longest span 1,500 ft., to the

miles

limestone quarry at Chignautla ($3\frac{1}{2}$ m.) at alt. of 7,800 ft. A drop of 1,800 ft. occurs in the upper 4,000 ft. of line (30 deg. incline). From Teziutlan a line is projected to the Gulf via Tlapacoyan and Nautla. Another line is projected from Zaragosa (see above) to Coetzalan in the rich coffee district of Zacapoaxtla.

Branch line, 3 ft. gauge, to (8 m.) Libres, whence there is another line, 3 ft. gauge, to (7.4 m.) Concepcion.

From Oriental line proceeds over the direct route constructed between this point and San Lorenzo in 1905, to Mexico City, through a hilly but not difficult country.

198 Mena, 8,425 ft., junction with the F. C. Agricola de Tlaxco (see p. 481).

220.4 Iturbe.

230.4 San Lorenzo, junction with the Interoceanic line from Puebla to Mexico City.

237.8 Irolo, 8,047 ft., junction with the Mexican Railway (Section XXIII).

248 Otumba. Here is a station of the Mexican Railway. Line now proceeds SW. to

255.2 Metepec.

269.5 Texcoco. Here line runs to the E. of Lake Texcoco.

Tramway, animal traction, 3 ft. gauge, to (10 m.) Chimalhuacan.

285.5 Los Reyes, whence line proceeds NW. to Mexico City. Junction with the Interoceanic line from Mexico City to Ixtla (see p. 470).

293.7 Mexico City, 7,348 ft. (see *Gazetteer of Towns*).

XVII.—ORIENTAL-PUEBLA-SAN LORENZO, 118 miles (Inter-oceanic Rly.)

This line forms part of the Interoceanic system and is of 3 ft. gauge.

miles	
0	Oriental, 7,693 ft., junction on Interoceanic direct route to Mexico City (see p. 465). Line proceeds SW. to Puebla, with Malinche, 14,740 ft., on the r.
9.3	Ojo de Agua (Salitral).
16	San Marcos, 7,785 ft., junction with the Mexican Railway to Mexico City (Section XXIII). Branch line to Huajuapán (see p. 481). Line crosses Mexican Railway.
24.8	La Venta.
31	Acajete.
38.5	Amozoc, 7,593 ft. Here is a station of the Mexican Southern Railway which now runs parallel with the line as far as Puebla.
50.3	Puebla, 7,100 ft. (see <i>Gazetteer of Towns</i>). Stations of the Interoceanic, Mexican, and Mexican Southern are close together and there is communication between them. (See also p. 468). Line now runs NW. to San Lorenzo, with Popocatepetl, 17,794 ft., and Ixtaccihuatl, 16,200 ft., on the l.
55.3	Los Arcos. Junction with the Interoceanic line to Cuautla (Section XVIII).
64.6	Analco. <i>Tramway</i> (private), 2 ft. gauge, animal traction, to (5 m.) Los Reyes. <i>Tramway</i> (private), 2 ft. gauge, animal traction, to (5 m.) Santa Agueda.
81.9	Tlaloc (Atotonilco), 7,864 ft. <i>Branch line</i> (private), animal and steam traction, 3 ft. gauge, to the Tenerife saw-mills, and connecting various mills and haciendas in the neighbourhood of Huejotzingo Length of

miles

	line 21 m. From Huejotzingo is a private line, animal traction, 3 ft. gauge, to Ixtaccihuatl, Texmelucan, and Hacienda San Simon y Tetla, 10 m.; and other short lines. There is also a line to Puebla (see below).
98	Nanac-Amilpa, 8,956 ft.
107	Mazapa, 8,786 ft.
111.8	Calpulalpam. <i>Tramway</i> (private), 2 ft. gauge, animal traction, to the Fabrica de San Bartolome, 11.8 m. long. <i>Branch line</i> (private), 3 ft. gauge, steam traction, to the Hacienda de San Bartolome del Monte, 3.7 m.
118	San Lorenzo, whence line proceeds to Mexico City (Section XVI).

XVIII.—PUEBLA—CUAUTLA, 108 miles (Interoceanic Rly.)

This line forms part of the Interoceanic system and is of 3 ft. gauge.

miles

0	Puebla, 7,100 ft., (see <i>Gazetteer of Towns</i>). <i>Branch line</i> (F. C. Industrial de Puebla), 4 ft. 8½ in. gauge, ? animal traction, to (5 m.) Los Arcos (see p. 467), (9.3 m.) Cholula, and (19.8 m.) Huejotzingo (see above). <i>Branch line</i> (F.C. Industrial de Puebla), 4 ft. 8½ in. gauge, ? animal traction, to (5.5 m.) Fabricas, (9.9 m.) Panzacola, and (10.5 m.) El Valor.
5	Los Arcos, (see p. 467).
8	Cholula (see above), for the Pyramid of Cholula. Line continues SW. and then from Atlitxco due south. Here is a branch line, steam traction, 2 ft. gauge, from San Lucas to Coronanco, 3.7 m. long.
28.5	Atlitxco, 5,531 ft. (see <i>Gazetteer of Towns</i>).

miles	
	<i>Branch line</i> (F. C. San Rafael y Atlixco), 3 ft. gauge, to (5·5 m.) Fabrica Metepec, (10·5 m.) Huexocoapam, (14·2 m.) Tochimilco, and (19·8 m.) Santa Catalina. For the other sections of the railway see Section XXI.
	Line now descends through the fertile Valley of Atlixco to
52·8	Matamoros, whence line ascends to Atencingo and continues NW. on an upward grade to Cuautla.
	<i>Tramway</i> , animal traction, 2 ft. gauge, to Rabozo and (4·3 m.) Campos de Caña; whence there are two lines, one to (6·8 m.) Tatetla (station on main line at m. 47·2), animal traction, 2 ft. gauge, the other to Mier (station on main line at m. 55·3) and San Nicolas, animal and steam traction, 2 ft. gauge, 12·4 m. in length.
	<i>Tramways</i> , animal traction, 2 ft. gauge, to Colon, Tilapa, and (3 m.) Rijo.
65·1	Atencingo. <i>Branch line</i> , 3 ft. gauge, to (12·4 m.) Tlancualpican.
75·7	Axochiupam.
100·6	Tenixtepango.
108	Cuautla, 4,267 ft., pop. 9,800; junction on the Interoceanic from Ixtla to Mexico City (Sections XX, XVIII, XIX, and XVI).

XIX.—CUAUTLA—LOS REYES, 73·9 miles (Interoceanic Rly.)

This line forms part of the Interoceanic system and is of 3 ft. gauge.

miles	
0	Cuautla, 4,267 ft., junction on line from Puebla to Ixtla (Sections XVIII and XX). Line proceeds NE. as far as Amecameca.
9·9	Yecapixtla.
18·6	La Cascada, whence there is a steep ascent to

miles	
22.9	La Retorta.
27.3	Nepantla. Here is a bridge of 103 ft. 3 in., with unequal spans; some of the trusses are of iron plates and others of rails. Ascent continues to
41.6	Ozumba. Here is a bridge 388 ft. 8 in. long, built upon 11 masonry piers and 5 more piers constructed of rails, properly braced. Trusses are also constructed of rails. Country between Ozumba and Temamatla, and between Ozumba and Yecapixtla, is considerably broken and line makes ascent on a curved location, with a max. grade of 2.5 per cent. and curves with a radius as small as 328 ft. The bridge over the Tinaco gulch is 79 ft. 3 in. long, with a span of 46 ft. 6 in. in the centre, crossed by Warren trusses and beams constructed of rails. Here is a junction with the F. C. de San Rafael y Atlitxco (Section XXI).
49	Amecameca (see <i>Gazetteer of Towns</i>), junction with the F. C. de San Rafael y Atlitxco. Line now continues in a NW. direction to Los Reyes.
59	Temamatla.
63.3	La Compañía. Here line is crossed by the F. C. de San Rafael y Atlitxco.
67	Santa Barbara. Line runs NE. of Lake Chalco and S. of Lake Texcoco, following shores of both lakes.
73.9	Los Reyes, junction with Interoceanic direct route to Mexico City (Section XVI).

XX.—CUAUTLA—PUENTE DE IXTLA, 50 miles
(Interoceanic Rly.)

This line forms part of the Interoceanic system, and is of 3 ft. gauge.

miles	
0	Cuautla, 4,267 ft., junction on the Interoceanic Railway from Puebla to Mexico City, via Los Reyes.

miles	
	(Sections XVIII, XIX and XVI). Line proceeds NW. as far as Yautepec.
1·8	Santa Ines. <i>Branch line</i> (private), 3 ft. 3 in. gauge, to (4 m.) the Hacienda de Santa Inés.
14·2	Yautepec, 4,205 ft. From this point line proceeds generally in a SW. direction.
37·2	Jojutla. <i>Branch line</i> (private), 2 ft. 1 in. (0·65 metre) gauge, 1·8 m. in length. <i>Tramway</i> , animal traction, 2 ft. 5 in. (0·75 metre) gauge, 9 m. long, between Jojutla and Zacatepec.
39·7	Zacatepec. <i>Branch line</i> (private), 3 ft. 2 in. (0·977 metre) gauge, to (1·2 m.) the Hacienda de Zacatepec.
50	Puente de Ixtla, junction with Mexican Central Railway from Mexico City to Balsas (Section XXII). Here the rivers Tembembe and Coaltan meet and form the Amacusac.

XXI.—MEXICO CITY—OZUMBA, 52·1 miles, and ATLAUTLA—APAPASCO, 18 miles (F.C. San Rafael y Atlixco)

This line is of 3 ft. gauge. For the section Santa Catalina to Altixco see Section XVIII.

miles	
0	Mexico City. Line runs W. of Lake Texcoco, with the Interoceanic Railway on l. The general direction is SE.
11·8	Zapotitlan.
13·6	Tlaltenco. From this point line runs on narrow neck of land between Lakes Xochimilco and Chalco, and crosses the latter lake to the island of Xico (19·8 m.) and continues to Chalco.
15·5	Tlahuac.
23·6	Chalco.
26	La Compañía. Line is crossed by the Interoceanic Railway which is now on the r.

miles	
41	Amecameca (see <i>Gazetteer of Towns</i>), junction with the Interoceanic Railway.
52.1	Ozumba, junction with the Interoceanic Railway. (<i>There is here a break in the line, which afterwards runs as follows</i>).
0	Atlautla.
18	Apasco. Beyond this point line will follow a difficult location.

XXII.—MEXICO CITY—CUERNAVACA—BALSAS, 181.3 miles
(Mexican Central Rly.)

This section of the Central Railway is of 4 ft. 8½ in. gauge, with a max. grade of 3½ per cent. over 25 miles of the system. The curves are compensated on grades. On the heaviest grades the capacity of the locomotives of 110 tons is four box cars loaded. The road is laid with 76 lb. English rails, American ties, tie plates, and spikes, and it is ballasted with lava and broken stone. In November 1916 the line was working only for military uses as far as Cuernavaca and the rest of the line was in the hands of the Zapatistas.

miles	
0	Mexico City, 7,348 ft. Trains leave the Estacion de Buena Vista and line takes a wide curve to the l.
2.4	Santa Julia. Here the line from Toluca is crossed. On l. is the Chapultepec Park.
7.4	Tacubaya (see <i>Gazetteer of Towns</i> , under <i>Mexico City</i>). Hence electric cars run to Mexico City. Line now runs almost due S.
9.9	Mixcoac, with botanic gardens.
11.1	Miranda. Line descends into small valley with the Rio de la Magdalena on the l. until crossed by railway.
13	Olivar. Line now ascends on reverse curves with many zig-zags up the Sierra de Ajusco (13,628 ft.).

miles	through the Vale of Anahuac. Line crosses old post road from Cuernavaca to the capital.
28·5	Apisco.
37·9	La Cima, 9,895 ft. Here line reaches highest point.
45·9	Las Tres Marias. Line now descends towards the tierra caliente with a descent of nearly one mile in 36 m.
56·5	El Parque, for ruins of Tepoxtepec.
68·3	Ramon. Line now reaches Valley of Morelos and curves to r. (W.).
73·9	Cuernavaca, 4,500 ft. (see <i>Gazetteer of Towns</i>), on W. of railway. Line descends valley, curving to l.
85·7	San Vicente. <i>Tramway</i> (private) in this neighbourhood, 19 m. long, animal traction, 2 ft. gauge, to the Hacienda de San Vicente.
111·8	Puente de Ixtla, junction with the Interoceanic Railway to Puebla (Sections XX and XVIII). In this neighbourhood is the Cañon de Mano, a tortuous defile, where the railway is cut out of the rock and built on masonry embankments under precipices over 2,000 ft. high. There are several tunnels and bridges. One of the latter is 300 ft. long and 125 ft. high, and is located on a difficult double reverse curve.
146·5	Iguala, 2,411 ft., for Taxco, about 5 hours' ride distant (see <i>Gazetteer of Towns</i> , for both). Line now runs SW. and crosses several tributaries of the Balsas river. From Iguala a motor road, 14 ft. wide rolled with crushed stone, with a max. grade of 4 to 4½ per cent., has been constructed to Chilpancingo, capital of State of Guerrero; and a similar road to Taxco, mining centre NE. of Iguala.
181·3	Balsas, mining centre, present terminus of railway, whence it was intended to continue it to the port of Acapulco. Bridge, 872 ft. long, over the Balsas river.

**XXIII.—VERA CRUZ—CORDOBA—IROLO—MEXICO CITY,
264 miles (Mexican Rly.)**

The Mexican Railway, registered in 1864 as the Imperial Mexican Railway Co. (name changed in 1867 to the Mexican Railway Co.), is owned by a British Company. The headquarters are at Mexico City. The line was opened on January 1, 1873.

The first survey was undertaken in 1858 by Col. Andrew Talcott, an American. During the French régime 133 m. were constructed and the railway was built simultaneously from both ends. The total length of lines, including sidings and second track, is 390 m., 4 ft. 8½ in. gauge; 27 m., 3 ft. gauge; 33 m., 2 ft. 6 in. gauge; 20 m., 2 ft. gauge; and 5 m. of tramway.

The main line and some of the branches are laid with steel ties spaced 16 to the 30 ft. rail. The rails on the mountain division are 82 lb. per yard, but were being changed in 1915 to 85 lb., 40 ft. T-rails of the British standard pattern. On rest of line there are 62 to 85 lb. rails.

On November 30, 1914, the rolling stock consisted of the following: 86 engines, standard gauge, and 14, narrow gauge; 99 passenger vehicles, standard gauge, and 21, narrow gauge; 1,134 goods vehicles, standard gauge, and 139, narrow gauge. Of the standard gauge goods wagons 123 were of 25 tons capacity and 565 of 27 tons capacity, with 45 coal wagons of 20 tons capacity and 145 of 27 tons capacity. There were one steam wrecking crane of 30 tons capacity and one of 75 tons capacity, with 7 hand cranes of 7 tons capacity, and 22 tank cars of 8,000 gallons capacity.

The following table gives particulars of the engines on June 30, 1914:

<i>No. of engines.</i>	<i>Maker.</i>	<i>Type.</i>	<i>Driving wheels.</i> inch.	<i>Cylinders.</i> inch.	<i>Heating surface.</i> sq. ft.
2	Dobs . . .	4-4-0	66	18×26	1152·91
4	Neilson . . .	4-6-0	54	18½×26	1328
6	Dickson . . .	4-6-0	54	20×26	2155
2	Baldwin . . .	4-6-0	48	20×26	2022
2	" . . .	4-6-0	48	20×26	2461
1	" . . .	4-6-0	44	18×24	1214·6
5	" . . .	4-6-0	51	18×24	1214·6
6	" . . .	2-8-0	44	19½×24	1317
3	" . . .	2-8-0	44	20×24	1317
3	Rhode Island Loco. Works	2-8-0	44	21×26	2239
4	Neilson . . .	0-8-0	42	18½×26	1811
10	Baldwin . . .	2-8-0	44	20×26	2006
6	" . . .	2-8-0	44	20×26	2006
1	Lima Loco. Works . . .	4-0-4	34	15·3×17	1993
3	Baldwin . . .	4-6-2	56	23×28	3816+ 528 in super heater
5	Neilson (Fairlie) . . .	0-6-0+0-6-0	41	16×22	1676
12	" " . . .	0-6-0+0-6-0	36	16×22	1712
10	" " . . .	0-6-0+0-6-0	36	16×22	1712
2	North British Loco. Co. . . (Heavy Fairlie)	0-6-0+0-6-0	42	17×25	2376
3	Vulcan Foundry Co. . . (Heavy Fairlie)	0-6-0+0-6-0	42	19×25	2984
—					
90					

The majority of these engines are oil-burning.

The Mexican Railway may be considered as divided into three great sections : (a) from Vera Cruz to the Paso del Macho ; (b) from the Paso del Macho to the Boca del Monte ; (c) from the Boca del Monte to Mexico City.

The first section, which is 28·5 m. in length, embraces 10 important bridges, the largest being that of Soledad across the Jamapa river.

The second section, 59·9 m. in length, passes over exceedingly broken ground, including the Chiquihuite and Metlac gulches and the summits of Maltrata. The curves are abrupt and the grades are as high as 4 per cent. in several places whose united length is 13·6 m. ; while grades of from 2 to 3½ per cent. exist along 24·8 m. There are in this section 28 bridges and viaducts, whose united length is 5,042·7 ft. ;

15 tunnels, with a united length of 3,467.9 ft.; and 201 culverts, both arched and open.

The third section of 156 m. is on a maximum grade of 1.5 per cent. and contains 53 bridges, 34 culverts with stone arches, and 262 open culverts.

The railway rises 5,500 ft. in the first 95 m. and then has a very sharp ascent of 2,500 ft. in 12 m. to the edge of the central tableland.

The average cost of 60 m. of the Mexican Railway was £37,000 per mile, and of 283 m. it was £14,000 per mile.

From January 1915 to August 1916 the railway was operated by the Carranzist authorities, and it was again taken over by the government in April 1917 and was so operated in September 1917. A great part of the machinery and other material of the shops at Apizaco and other points has been removed and transferred to the shops of the Vera Cruz-Isthmus Railway and the Pan-American Railway. In January 1916 it was stated that the rolling material was in a deplorable state, principally because of lack of shop facilities. The railway shops at Orizaba and the rolling stock in them were destroyed by revolutionaries, and the line generally was much damaged. In 1917, however, it was reported that the permanent way was in better condition than might have been expected over the greater part of the system, in view of the difficulty of procuring materials. The mountain section was in a bad state, though traffic could be carried on. Destroyed stations had not been rebuilt.

In September 1917 it was announced that sleeping-cars were running to Mexico City and that trains ran through in 14 hours 30 minutes.

miles

- | | |
|-----|--|
| 0 | Vera Cruz, 5 ft., coastal terminus, whence line crosses low sand-hills to |
| 9.9 | La Tejeria, 107 ft. Here line crosses ground known as <i>tepetate</i> , of which the basis is consolidated volcanic mud, and passes over undulating country in which the heaviest grade is 60 ft. per mile (1.13 per cent.). |

miles

- 26 Soledad, 305 ft. Here the Jamapa river is crossed by a double bridge, originally constructed as a highway bridge, the upper portion carrying the railway, and the lower, with truss spans, serving as a roadway. There are five spans over the bed of the river, resting on stone piers, and others on land. Bridge is 748 ft. long and 102 ft. high. Line follows S. bank of Jamapa river for 17 m. and ascends through narrow valleys and rocky defiles on heavy grades, rising from 70 ft. to 110 ft. per mile (2.08 per cent.), to point where the Jamapa takes a NW. course (m. 45) to Pueblo Viejo. Here line leaves neighbourhood of river.
- 47.8 Paso del Macho, 1,571 ft., station, beyond which ascent continues and gradually becomes steeper.
- 50.9 Bridge of three spans over the Rio San Alejo, resting on stone abutments and two metal piers. Length of bridge 328 ft. Line descends and runs along eastern base of the Chiquihuite range.
- 51.5 Chiquihuite bridge, 220 ft. long and 90 ft. high, of three spans resting on stone abutments and two stone piers. Between this point and Atoyac are the Atoyac Falls (see p. 144). Line passes through two tunnels, 139 ft. and 320 ft. long.
- 53.4 Bridge over Atoyac river, 328 ft. long, with three spans resting on stone abutments and two metal piers.
- 54 Atoyac, 1,512 ft. A little beyond, line enters the valley of El Potrero and then, following the divide between the waters of the Atoyac and Seco, it reaches the Rio Seco, a short distance W. of
- 64 Penuela. Line crosses Rio Seco on a curved bridge of 246 ft. and curving S. intersects road and, passing over broken ground to San Miguelito, proceeds to
- 65.8 Cordoba, 2,713 ft., (see *Gazetteer of Towns*). Junction for Vera Cruz and Isthmus Railway (Section XXVI).

miles

Branch line (F. C. de Cordoba á Huatusco), 1 ft. 11 $\frac{3}{8}$ in. (0.6 metre) gauge, to (1.8 m.) San Antonio, (10.5 m.) Monte Blanco and (19.8 m.) Coscomatepec, whence line is to be continued to Huatusco.

70.8 Fortin, 3,310 ft. Here line crosses iron bridge with 5 spans and enters a tunnel. Line now turns sharply to the r., and descends the deep Metlac barranca.

72.1 Metlac bridge, built on a curve of 325 ft. radius and has nine spans of 50 ft. each, resting on metal piers on masonry bases. Grade, 3 per cent. ; height above river 80 ft. Line ascends to opposite side of valley on a 2 $\frac{1}{2}$ per cent. grade. This passage is considered the most dangerous on the line. The suggested high-level bridge at this point for the present has been abandoned. Between the Metlac bridge and Sumidero are 5 tunnels 328 ft., 408 ft., 236 ft., 382 ft., and 833 ft. long respectively.

75.1 Sumidero. Important coffee centre. Line crosses barranca on bridge. Line crosses the Escamela bridge, 100 ft. long, and the San Juan de Dios bridge, 148 ft. long.

82.6 Orizaba, 4,025 ft. (see *Gazetteer of Towns*). Railway crosses two bridges, one being over the Rio Blanco. *Tramway* (F. C. de Orizaba á Nogales), animal traction, gauge 3 ft. 5 $\frac{1}{2}$ in., to Rio Blanco, (6.2 m.) Nogales Santa Rosa, and (9.9 m.) Cerritos, connecting with Mexican railway at Rio Blanco and Nogales Santa Rosa.

Tramway (F. C. Orizaba al Ingenio), animal traction, 4 ft. 8 $\frac{1}{2}$ in. gauge, to (4.6 m.) Ingenio.

86.9 Nogales, 4,235 ft. Cotton mills. Line ascends fairly steady incline, enters the Valley of Encinal, and passes through a gorge, known as El Infiernillo, which receives the water drainage of the upper valley.

Tramway (private), animal traction, 4 ft. 8 $\frac{1}{2}$ in

miles

(1.44 metres) gauge, to (1.3 m.) Alchipin ; from Alchipin (private), animal traction, 3 ft. 1 in. (0.945 metre) gauge, to (0.6 m.) Palo Verde ; from Palo Verde, (private), funicular, 0.945 metre gauge, to (9.3 m.) Sierra de Agua.

- 93 Infiernillo viaduct, built on a curve, has nine spans, resting on stone piers ; length 305 ft. Line now goes through tunnel and crosses five other bridges and viaducts, one of which is 298.5 ft. in length. Grades very heavy, often 4 per cent. and over, not compensated for curvature, and having curves of 350 ft. radius, many of which are reverse curves and are so short that frequently a train will be on three curves at once. Fairlie engines of duplex double-boiler type are used here. The latest of these engines, built by the Vulcan Iron Works, Eng., have six 48 in. driving wheels under each end, with a wheel base of 9 ft. 3 in. for each group and 35 ft. 6 in. for the entire engine. Weight is about 153 tons in working order, with a tractive power of 59,134 lbs. Trains are often run in two sections and all freight trains are handled with two engines, one at each end. Trains of 680 tons are hauled at an average speed of 10 m. p. h.

Line passes through the La Joya valley, crosses the La Joya viaduct and reaches

- 96-9 Maltrata, 5,564 ft. Village is overhung by cliff, 2,000 ft. high, known as the Devil's Balcony. Line continues to ascend on very sharp inclines, on a grade of 4 per cent., proceeds up and through the gorge by many curves, and crosses several bridges and viaducts.

- 98-1 La Bota. Here is a tunnel, then a bridge (Las Cumbres), another tunnel, a bridge with 3 spans, and two tunnels. Line makes a complete turn and on opposite side of gorge is

miles

- 103.1 Alta Luz, 6,889 ft. Water tank. Line crosses a bridge, proceeds through tunnel,¹ crosses chasm at m. 105.6 over the Wimmer Bridge. This bridge is built on a curve, has 5 spans of 55.9 ft. each, and rests upon metal piers built upon stone foundations length 278.8 ft. Line now proceeds through tunnel, crosses at m. 107.4 two bridges, and proceeds through tunnel. Here the gradient is 200 ft. to the m. (3.7 per cent.), with an ascent of 3,000 ft. in 18½ m. west of Boca del Monte. The average grade on this section is 165 ft. to the mile (3.2 per cent.).
- 108.11 Boca del Monte, 7,926.6 ft. Line continues to the S. of Orizaba mountain, 18,225 ft., and between Boca del Monte and Esperanza reaches an altitude of 8,104 ft.
- 111.8 Esperanza, 8,049 ft. Here is a branch line of the Mexican Southern Railway (from Esperanza to Tehuacan) joining the line from Puebla to Oaxaca, (Section XXVII).
- Branch line*, 4 ft. 8½ in. gauge, to (15.5 m.) Xuchil a timber district in the Sierra Negra.
- 127.3 San Andres, 7,972 ft., where just east of the station is an elevation of 8,153 ft. From this point there is a practically level run to Mexico City, although a higher elevation is reached between Apizaco and Huamantla.
- Branch line* (F. C. de Chalchicomula á San Andres), 4 ft. 8½ in. gauge, to (6 m.) Chalchicomula (for ascent of Orizaba), whence there is a tramway, animal traction, 4 ft. 8½ in. gauge, to Tlachichuca and (19.2 m.) La Capilla; and another private line, animal traction, 4 ft. 8½ in. gauge, from Chalchicomula to (7.4 m.) Jalapasco.

¹ At this tunnel an accident occurred on Oct. 5, 1915, when a portion of a train became detached and rushed down the incline; 300 people were killed.

miles

- 139·7 Rinconada, 7,732 ft.
- 150·9 San Marcos, 7,785 ft. The peak of Malinche or Matlacueyatl, 14,740 ft., lies to SE. Junction with the Interoceanic Railway (Vera Cruz, Jalapa, Puebla; Sections XVI and XVII).
Branch line (F. C. de San Marcos á Huajuapán de León), 3 ft. (0·914 metre) gauge, to (8·6 m.) La Cima, (27·3 m.) Rosendo Marquez (junction with Mexican Southern line, Section XXVII), (38·5 m.) Santa Clara, (75·6 m.) Mucio Martínez, whence line is to be continued to Acatlán and Huajuapán, for the coal and iron deposits in the State of Oaxaca.
- 162·1 Huamantla, 8,162 ft. Between Huamantla and Apizaco line reaches greatest elevation, 8,323 ft.
- 170·2 Acocotla, 8,310 ft.
- 177·6 Apizaco, or Barrón-Escandón, 7,913 ft. Line crosses Río Atenco.
Branch line (F. C. Agrícola de Tlaxco), 4 ft. 8½ in. gauge, animal traction (?), to (9·9 m.) Ahautepec and (14·9 m.) Tlaxco.
Branch line, 4 ft. 8½ in. gauge, to Santa Ana (10·5 m.) 7,506 ft., (with line, 4 ft. 8½ in. gauge, animal traction, to (5·5 m.) Tlaxcala, 7,500 ft.: see *Gazetteer of Towns*,) (18 m.) Zacatalco, and (29·2 m.) Puebla, 7,069 ft.
- 183·9 Muñoz. *Branch line*, 1 ft. 11⅔ in. (0·6 metre) gauge, to (23 m.) Aserrado, (30 m.) Atlamaxac, and (33 m.) Chignahuapán.
- 186·9 Guadalupe, 8,132 ft. Line crosses Interoceanic Railway (Constitutionalist Railways). Near here at the Ocotlán siding an elevation of 8,333 ft.(?) is reached, whence the plain slopes gradually to Mexico City.
- 196·2 Soltepec, 8,227 ft.
Tramway (private), 4 ft. 8½ in. gauge, animal

miles

traction, to (6.2 m.) Mazaquiahuac, with another line to same place on 2 ft. 4 in. gauge. From Mazaquiahuac there is a line, 2 ft. 4 in. gauge, animal traction to (5 m.) Rosario.

Tramway (private), 4 ft. 8½ in. gauge, animal traction, to (6.2 m.) Mimiahupan.

Tramway (private), 4 ft. 8½ in. gauge, animal traction, to (3.1 m.) Quintanilla.

Tramway (private), 2 ft. 4 in. gauge, animal traction, to (5 m.) Buena Vista.

Tramway (private), 1 ft. 11⅔ in. (0.6 metre) to San Blas.

199.43 Tetlapayac. *Branch line* (private), 3 ft. (0.914 metre) gauge, to (6.2 m.) Rancho Santa Barbara.

205.6 Apam, 8,178 ft., centre of the *pulque*-producing industry. *Tramway* (private), animal traction, 3 ft. (0.914 metre) gauge, to Espejel, Tlalayote, and (6.2 m.) Rancho San Miguel.

There are numerous other tramways in this district.

211.86 Acopinalco. *Branch line* (private), 3 ft. (0.914 metre) gauge, to (5 m.) Hacienda Chimalpa.

215.9 Irolo, 8,047 ft. Here line is crossed by Interoceanic Railway (Section XVI), junction.

Branch line, 3 ft. (0.914 metre) gauge, to (8.6 m.) Tlanalapa, (18 m.) San Augustin, (21.7 m.) Tepa (whence there is a line to Tortugas, see p. 461), and (38 m.) Pachuca, 7,824 ft. Also from Tepa, via (5.5 m.) Xochihuacan and (13.6 m.) Coscotitlan to (16 m.) Pachuca.

Line now continues in NW. direction to

221.8 Ometusco, 8,077 ft., important *pulque* centre.

Branch line, 4 ft. 8½ in. gauge, to (8 m.) Tepa (see above), (14.9 m.) San Jose, and (20.5 m.) Pachuca (via Xochitl and San Jose).

Here is the divide between the Apam Valley and the Valley of Mexico, which line crosses on a grade

miles	of 1·5 per cent. Line now proceeds in a SW. direction to Mexico City.
229·8	Otumba, 7,706 ft., station 2 m. from town. Here line is again touched by Interoceanic Railway which has a station at Otumba (Section XVI). <i>Tramway</i> (private), animal traction, 1 ft. 11 $\frac{3}{5}$ in. (0·6 metre) gauge, to (6·2 m.) Hacienda de Hueyapam. <i>Tramway</i> (private), animal traction, 1 ft. 11 $\frac{3}{5}$ in. (0·6 metre) gauge, to (7 m.) Cuautengo. Line proceeds over plain of Otumba to
231·1	Hueyapam. City draws its electric power from the Falls of Necaxa (State of Puebla : Huachinango district) : see p. 142. These falls also supply power to Mexico City and the mines of El Oro.
236·3	San Juan Teotihuacan, 7,486 ft. Here line runs to the W. of Lake Texcoco.
261·5	Guadalupe, celebrated place of pilgrimage. Station of the Constitutionalist Railways on line from Mexico City to Beristain. Line crosses Rio Guadalupe.
264	Mexico City, 7,348 ft.

XXIV.—VERA CRUZ—ALVARADO, 43·4 miles (Vera Cruz Rly.)

The Vera Cruz Railway has been greatly damaged and was not working in October 1917. The gauge is 3 ft.

The rolling stock consisted of 5 locomotives, 14 coaches, and 75 wagons.

miles	
0	Vera Cruz. Line runs due S. to
8·6	El Tejar. Line crosses small river on a single-span steel bridge and now runs SE.
9·3	Medellin, 170 ft. Here the Atoyac and Jamapa rivers meet.
11	Paso del Toro, 29 ft., centre of farming district.

miles

- At m. 11.1 line is crossed by the Vera Cruz-Santa Lucrecia line (Section XXV), with the Lagunas de Mandinga on l.
- 16.7 Laguna, shipping point for timber.
- 27.9 Salinas. Line proceeds down narrow peninsula between the lagoons and the sea to
- 43.4 Alvarado (see *Gazetteer of Towns*). Steamers for places on the Papaloapan river and its tributaries.

XXV.—VERA CRUZ-SANTA LUCRECIA, 206.6 miles (Vera Cruz and Isthmus Rly.)

The Vera Cruz and Isthmus Railroad Co. was incorporated under the laws of the State of West Virginia in 1898. The lines now form part of the Constitutionalist system. The gauge is 4 ft. 8½ in.

Rolling stock is stated to be 30 locomotives, 27 coaches, and 528 wagons.

miles

- 0 Vera Cruz. Line proceeds due S. to
- 8 Boca del Rio. Line crosses Rio Jamapa and northern end of Lagunas de Mandinga.
- 13 Paso del Toro, 29 ft. Here line is crossed by Vera Cruz-Alvarado railway (Section XXIV).
- 34.7 Rio Blanco. Line crosses river and runs SW.
- 42.8 Joachin. Line crosses Rio Joachin.
- 46.6 Moreno. Line crosses Rio Moreno.
- 53.4 Estanzuela. Line crosses Rio Estanzuela.
- 60.8 Tierra Blanca, junction on line from Cordoba to Santa Lucrecia (Section XXVI). Line proceeds through valley of Rio Amapa, with river some distance on r.
- 68.9 Vista Hermosa. Grade now continues upwards.
- Los Changos. Line now runs NE. and then SE. to
- 78.3 Los Naranjos. Line runs almost due S.
- Branch line (Mexican Eagle Oil Company),*

miles	2 ft. gauge, animal traction, to Cuchillos and Tepetate.
86.3	Tres Valles. <i>Branch line</i> , ? 4 ft. 8½ in. gauge, to Kilometro B 20 (whence there is another line to (3.7 m.) Cerro Colorado), (24.8 m.) Cosamaloapan and (29.8 m.) San Cristobal, both on the Rio Papaloapan.
93	El Hule. N. of this station the Rio Papaloapan is crossed by a bridge of 5 spans of 150 ft. each. Line enters State of Oaxaca and proceeds E. and NE. through fruit-growing region. Line crosses Rio del Obispo. To W. lies the Valle Nacional.
109.9	Agua Fria. E. of this station line re-enters State of Vera Cruz.
128	Paso del Cura. Line now crosses the Rio Tezechoachan and runs in E. direction.
150	El Burro. <i>Branch line</i> , ? 4 ft. 8½ in. gauge. Line runs NE. to (15 m.) Cuatotolapam where the Rio Verde and Rio San Juan are crossed; and (23 m.) Chacalapam, where the Rio Tuxtla is reached. Line now follows the valley of the Rio Tuxtla to (29.8 m.) Laurel, (32.3 m.) Tilapam, and (44.7 m.) San Andres Tuxtla, 935 ft. (see <i>Gazetteer of Towns</i>). It is intended to prolong this line to Alvarado (see p. 484). There are numerous wooden bridges on this branch damaged during the revolution.
	Line runs SE. to
175.2	Colorado. N. of Colorado line crosses Rio Colorado and a few m. S. of station it crosses Rio Trinidad.
189.5	Santa Rosa. A few m. S., at Naranjos, line crosses the Arroyo Naranjo and proceeds to
206.6	Santa Lucrecia, junction with Tehuantepec Railway (Section XXX).

XXVI.—CORDOBA—TIERRA BLANCA, 57·7 miles (Vera Cruz and Isthmus Rly.)

This line forms part of the Vera Cruz and Isthmus Railway and is of 4 ft. 8½ in. gauge.

miles	
0	Cordoba, 2,713 ft., junction with Mexican Railway (Section XXIII). Line describes wide curve to r., and traverses very fertile district crossed by numerous waterways.
3·1	Amatlan, 2,605 ft. Line runs in SE. direction.
5	Los Angeles. Here line approaches l. bank of the Rio Blanco and follows valley of river.
8·7	San Nicolas, 2,106 ft.
15	Xuchiles. Line enters cañon of the Rio Blanco, proceeds on a sharp downward slope, and crosses river on a créscent-shaped bridge, damaged during revolution.
17·3	Omealca. Village lies some distance away on the Rio Blanco.
21·7	Presidio. Line enters an extensive sugar-producing region.
26	Motzorongo. Line crosses tributary of Rio Juan Sanchez.
	<i>Branch line</i> (6·2 m.), 2 ft. 3½ in. (0·7 metres) gauge, steam traction, to the Hacienda de Motzorongo.
29·8	Tezonapa. Line crosses Rio Cosolapa by a high bridge, damaged during revolution.
37·9	Acatlan. Near here line crosses Rio Juan Sanchez, a wide but shallow stream, and proceeds due E. across numerous waterways.
48·4	Tetela. E. of this station line crosses Rio Amapa.
52·8	Las Prietas. Line runs SE. to
57·7	Tierra Blanca, junction of branch line from Vera Cruz (Section XXV).

XXVII.—PUEBLA-OAXACA, 228 miles (Mexican Southern Rly.)

The Mexican Southern Railway was registered in London in 1889. The line was taken over by the Interoceanic Railway of Mexico in 1910 and now forms part of the Constitutionalist Railways.

The railway follows a difficult route, where construction was costly, from Puebla to Oaxaca. The present terminus is at Oaxaca, but from this point concessions have been granted for the construction of lines to the Pacific coast.

The gauge is 3 ft. (For rolling-stock see p. 463.)

miles	
0	Puebla, 7,100 ft., junction with Mexican Railway and Interoceanic Railway (Sections XXIII, XVII, and XVIII). Line proceeds over comparatively level country in WSW. direction, with relatively low grades, the steepest being 1·8 per cent., with a min. curve of 628 ft., as far as Tehuacan. Line crosses numerous <i>arroyos</i> .
8·6	Chachapa, 7,413 ft. <i>Tramway</i> , 2 ft. gauge, animal traction, to (4·3 m.) Hacienda de Chapula.
11·8	Amozoc, 7,593 ft., highest point on line. Here is a station of the Interoceanic Railway (see p. 467).
16·1	Santa Rosa, 7,521 ft.
17·3	Tres Jagüeyes, 7,530 ft.
23·6	Tepeaca, 7,353 ft. Line now curves to the l. and again proceeds SW.
34·1	Rosendo Márquez, 6,737 ft., junction on F.C. de San Marcos á Huajuapán de León (Section XXIII).
41	Tecamachalco, 6,602 ft.
54·6	Tlacotepec, 6,469 ft.
65·1	Tepanco, 6,042 ft.
73·9	Carnero, 5,640 ft.
79·5	Tehuacan, 5,408 ft. (see <i>Gazetteer of Towns</i>). <i>Branch line</i> , ? 4 ft. 8½ in. gauge, to (15 m.)

miles

Llano Grande, and (31.6 m.) Esperanza, junction on Mexican Railway (Section XXIII).

Line now descends rapidly, with a difference of 616 ft. in 9 m. (1.2 per cent. average grade). In order to secure a practicable grade there are numerous horse-shoe curves.

88.2 La Huerta, 4,762 ft.

92.5 Sanchez, 4,496 ft. Line proceeds downward over many reverse curves.

99.4 Pantzingo, 4,080 ft.

103.7 San Sebastian, 3,769 ft.

112.4 Venta Salada, 3,178 ft. Here line dips sharply and crosses a deep gorge by a steel bridge.

119.9 Aldama, 3,000 ft. Line descends sharply through narrow valley to

121.7 San Antonio, 2,578 ft. Here line enters a series of difficult gorges and descends through the cañon of the Rio Salado, in which are 3 tunnels with a total length of 984 ft., to

124.2 Ignacio Mejia, 2,292 ft. Line continues its descent through the San Antonio cañon, which it crosses by steel bridges. Here there are numerous tunnels and several difficult curves, some of which have a radius as small as 290 ft., with short tangents, following which are grades, which used to be as great as 4 per cent., in order to ascend the mountain range which now intervenes.

139.8 Tecomavaca, 1,869 ft. Here there was a long steel bridge with two spans of 164 ft. each over the Rio Salado (reconstructed with four spans of 30 ft. 6 in. each and a central span of 49 ft. 2 in.), and a little beyond is a similar bridge over the Rio Grande.

146.2 Quiotepec, 1,767 ft. Here lowest point on line is reached, representing a drop of 5,826 ft. in 134 m. Railway continues through the Cañon Grande de Quiotepec and ascends to

- miles
- 157.1 Cuicatlan, 1,948 ft.
- 159 Line again crosses Rio Grande on bridge with two spans of 131 ft. each.
- 160.3 Tomellin, 2,013 ft. Line now follows course of the Rio Tomellin (further on called the Rio de San Antonio) over extensive masonry constructions. Although railway is placed beyond the reach of the highest floods in the gulches, the currents undermine the embankments and constant vigilance and frequent repairs are requisite. In this section particularly the rolling-stock suffers greatly, as the line consists more of curves than of tangents and length and speed of trains consequently are greatly reduced.
- 165.2 Organal. Here ravine is crossed by single-span steel bridge. Cañon narrows and river is crossed seven times in 24 m. There are 3 tunnels.
- 171.4 Almoloyas, 3,447 ft. Line ascends 900 ft. in less than 10 m.
- 182 Santa Catarina, 4,359 ft.
- 191.9 Parian, 4,890 ft. Here river is diverted from its natural course into stone tunnels, there are numerous high bridges, and the masonry embankments are lofty and extensive. Line rises 1,400 ft. in 8.7 m.
- 200.6 Las Sedas, 6,304 ft. From this point line descends into the fertile Oaxaca Valley. Descent commences abruptly on a max. grade of 3.75 per cent. The grade is never less than 1.5 per cent. and curves are continuous.
- 208.6 Huitzo, 5,520 ft.
Etla, 5,382 ft. Line now runs through the valley of the Oaxaca river.
- 228 Oaxaca, 5,067 ft. (see *Gazetteer of Towns*).
Branch line (F.C. de Oaxaca á Ejutla), 3 ft. gauge, (14.9 m.) to Teruel (whence there is a branch, 3 ft. gauge, to (2 m.) Zimatlan), (24 m.) Ocotlan, 4,922 ft., mining centre, and (43 m.) Ejutla, 4,847 ft., mining centre.

miles

Branch line, 3 ft. gauge, to (8 m.) Tule, and (20 m.) Tlacolula, mining centre, for the ruins of Mitla (9 m.).

Branch line, 3 ft. gauge, to (17.6 m.) San Pablo, and (34.6 m.) Taviche, 5,951 ft., mining centre.

Branch line (F.C. Agricola de Oaxaca), 3 ft. gauge, to Chapultepec San Juan and (16 m.) Ayoquesco (or Villa Alvarez), 5,242 ft.

Tramway, animal traction, 3 ft. gauge, to (5 m.) Oriente.

XXVIII.—GUADALAJARA—MANZANILLA, 221.2 miles (Mexican Central Rly.)

The railway from Irapuato to Manzanilla was begun in 1887 and the section to Guadalajara was finished in 1888. In 1899 the line was extended to Zapotlan, which was reached in 1901, and to Tuxpan in the same year, whence the previously existing narrow-gauge line was reconstructed to Manzanilla. The railway is now of standard gauge (4 ft. 8½ in.). Numerous tunnels exist between Tuxpan and Caleras, the majority of which are lined. The ruling grade is 2 per cent.

miles

0

Guadalajara, 5,551 ft. (see *Gazetteer of Towns*). Junction for railway from Irapuato, on main line, to San Marcos (Section XXIX). During latter part of 1916 work was begun on a new railway intended to run from Guadalajara to Chamela, a small port on the coast of Jalisco. This line will run through the centre of the State and traverse a fertile country. The railway to Manzanilla flanks the Lago del Agua Azul and then ascends to

4.4

La Junta, where main line is left. Railway proceeds in S. direction to

miles

- 17.4 Tlajomulco, where there begins a gentle downward grade in a NW. direction.
- 31.9 Mazatepec. Line now proceeds S., crossing a shallow arm of the Lago de Atotonilco, between Santa Ana and Santa Catarina.
- 56 Zacoalco, 4,500 ft. Line proceeds westward of the Lago de Sayula.
- 83.9 Sayula. Line ascends sharp incline to
- 92.3 San Nicolas, 5,173 ft., and before reaching Zapotlan skirts the shores of Zapotlan lake.
- 101.3 Zapotlan, 5,000 ft. (see *Gazetteer of Towns*).
- 103.3 Continental Divide is crossed at elevation of 5,084 ft. Thence line descends on 2 per cent. max. grade compensated, with min. curve radius 630 ft.
- 112.5 Zapotiltic, 4,303 ft., with passing track and spur for wagon goods.
- 118.7 Tuxpan (to be distinguished from the Gulf port of that name), 3,762 ft., with passing track. Line now follows course of Tuxpan River.
- 122.7 Valley closes into a narrow cañon. Tunnel, 496.2 ft. long, followed after a few feet by a bridge, 262 ft. long, 51 ft. above river. Bridge has clear width of 16 ft. and height of 23 ft. above top of the rail. Standard loading is 2 locomotives, with 55,000 lb. on the drivers, followed by 5,500 lb. per lineal foot.
- 123.5 Quinto, 3,457 ft., with passing track. One mile beyond, opposite the Atenquique barranca, there was an unusually heavy flood on October 3, 1906, which caused a landslide, and necessitated change of line and building new tunnel.
- 126.1 Tunnel, 247.6 ft. long, lined with concrete blocks.
- 127.3 Tunnel, 1,409.7 ft. long.
- 127.4 Platanar, 3,114 ft., with passing track.
- 130 Line crosses Bejuco barranca, 172 ft. deep, on deck bridge, 118 ft. long.

miles

- 131.2 Line crosses Colomos barranca, 146 ft. deep, on deck bridge, 141 ft. 6 in. long.
- 132.5 Tunnel, 286.3 ft. long.
- 135.1 Line crosses Tuxpan river for the second time over a bridge, 197 ft. above bed of river and 471 ft. long. There is one deck span, 370 ft. long, and two girders, 50 ft. 6 in. long, one at each end of the centre span.
- 136(?) Villegas, 2,489 ft., with passing track.
- 136.1 Tunnel, 259.7 ft. long.
- 138.7 Tunnel, 804.9 ft. long.
- 138.9 Cachipehuala bridge, 190 ft. 6 in. long and 111 ft. above bottom of barranca, with one span, 116 ft. long, and two girders, 30 and 45 ft. 6 in. long.
- 139 Tunnel 317.3 (or 656 ?) ft. long.
- 140.2 Tunnel, 1,341 ft. long. Line curves northwards and continues to descend from central plateau.
- 140.8 Tonilita, 2,160 ft., with passing track. Twelve m. above Tonilita in a NW. direction is Tonila, a notable sugar area on the slopes of Colima mountain.
- 141 Queseria bridge, 492 ft. 6 in. long and 204 ft. above bottom of barranca, with one deck span, 287 ft. long, and two 40 ft., one 50 ft., and one 75 ft. girders at the west end.
- 141.5 Tunnel, 178.75 ft. long.
- 142.5 Queseria, with a spur track.
- 142.7 Los Yugos bridge, 421 ft. long, 191 ft. above bottom of barranca, with centre span, 175 ft. long.
- 143.9 Santa Rosa bridge, 398 ft. long and 279 ft. above bottom of barranca, with centre span, 154 ft. long, and a 48 ft. and a 50 ft. 6 in. girder at each end.
- 144.1 Tunnel, 451 ft. long.
- 145.3 Fernandez, 2,047 ft. About half a mile W. the line begins to ascend out of the Tuxpan country to the tablelands, with a 2 per cent. grade for 1.8 m. Here the Colima valley is overlooked.

miles

- 145.9 Salado river bridge, with a 125 ft. deck span and 62 ft. above bottom of barranca.
- 146.8 Tunnel, 714.6 ft. long.
- 147 Carpintero bridge, 391 ft. long and 170 ft. above bottom of barranca. The longest span is 230 ft., with two 40 ft., one 50 ft., and one 40 ft. girder at the approach.
- 147.2 Tunnel, 241 ft. long.
- 147.8 Alzada, 2,202 ft., with passing track.
- 151.2 Huerta bridge, 285 ft. long and 63 ft. high, with longest span 154 ft., and three 30 ft. girders and one 40 ft. 6 in. girder.
- 152 Water tank with capacity of 75,000 gallons. Salvador, 1,994 ft., with passing track.
- 156 San Joaquim bridge, 455 ft. long and 106 ft. high, with longest span of 114 ft.
- 157.4 Canas bridge, with 108 ft. deck span and 107 ft. above barranca.
- 158.3 Estancia bridge, 88 ft. long and 49 ft. high.
- 158.5 Estancia, 1,663 ft.
- 161.6 Colima, 1,538 ft. (see *Gazetteer of Towns*), with oil and water tanks and numerous side tracks.
Branch railway being built (1909) by Colima Lumber Co., on 3 ft. gauge and about 24 m. long.
 Line continues towards NW.
- 161.9 Line crosses Colima river by bridge with 150 ft. span, 30 ft. above bottom.
- 162.4 80 ft. girder bridge.
- 164.2 Balcon, with passing track.
- 169.6 Coquimatlan, 1,009 ft., with water tank and passing tracks. Hence to the coast is a 1 per cent. max. grade.
- 171.1 Colima river is again crossed by a bridge with span of 150 ft., 30 ft. above bottom, damaged during the revolution and subsequently repaired. Line here

miles	runs on the side of a hill with some steep slopes for some 17 m. Here the Colima river is joined by the Armeria which in times of flood covers entire valley for from one to two miles in width.
175	Jala, 767 ft., with passing track.
176.3	Tunnel, 1,043.2 ft. long.
177.4	Tunnel, 525.8 ft. long.
179.6	La Madrid, 552 ft., with passing track.
182.6	Tunnel, 238.1 ft. long.
185.7	Caleras, with water tank.
189.8	Tecomam, 166 ft., with passing track.
192.6	Armeria bridge of one span of 212 ft. 5 $\frac{3}{8}$ in., and five spans of 133 ft., total length 877 ft. This bridge, which was formerly one span of 212 ft. and two spans of 133 ft., was rebuilt on account of the heavy floods that occur here. It was damaged during the revolution and has been repaired.
194.1	Armeria, with passing track, and 75,000 gallon water tank. Here is a twin arm of the sea separating the Laguna de Cuyutlan from the Pacific Ocean.
201.3	Cuyutlan, popular bathing resort on the Laguna de Cuyutlan, with passing track.
214.4	Tepalcate Rock. Passing track.
218.7	Campos, with sidings and 125,000 gallon water tank.
221.2	Manzanilla, port (see <i>Gazetteer of Towns</i>).

XXIX.—IRAPUATO—SAN MARCOS, 244 miles
(Mexican Central Rly.)

This line forms part of the Mexican Central system and is of 4 ft. 8 $\frac{1}{2}$ in. gauge.

miles	
0	Irapuato, 5,800 ft., station on main line to Mexico City (Section VI). Line parallels main line for short distance.

miles

- 3·7 Irapuato (see *Gazetteer of Towns*). Thence line proceeds SW. over fertile level plain.
- 14·9 Rivera.
- 40·3 Penjamo (see *Gazetteer of Towns*). Town lies about 3 m. from railway.
Branch line to (19·5 m.) Villachuato, (29·1 m.) Curimeo, (35 m.) Panindicuaro, (46·5 m.) Jauja, whence there is a branch to (3·1 m.) Cantabria, (48·4 m.) Zacapu. This line was being constructed (1914) to (83·8 m.) Ajuno, on the line to Uruapan (Section XII).
- 65·2 La Piedad (see *Gazetteer of Towns*). Town 4 m. from station. Between La Piedad and Yurecuaro are numerous sharp curves.
Tramway, 3 ft. gauge, animal traction, to (4 m.) La Piedad Cabadas.
- 91·3 Yurecuaro.
Branch line to (25·7 m.) Zamora (see *Gazetteer of Towns*), whence line proceeds W. to (43 m.) Moreno, and thence SE. to (73 m.) Tinguindin, and (85 m.) Los Reyes. Five hours SE. lies Uruapan (see p. 459).
 Line now crosses broken country to the La Barca valley and crosses the Lerma river on a steel bridge.
- 98·1 La Barca, on the Lerma river, 4 m. from station, centre of a wheat-producing area.
- 122·4 Ocotlan, station for Lake Chapala. *Branch line* to (21·7 m.) Atotonilco, centre of orange district. Line crosses the Rio Zula twice. Gauge 5 ft. (1·55 metre).
 Line crosses the Rio Santiago and continues on the S. side of that river.
- 140·3 Atequiza, a point of departure for Lake Chapala.
- 150·2 El Castillo. *Branch line* (F.C. Juanacatlan), 4 ft. 8½ in. gauge, to (4·3 m.) Juanacatlan, for the Falls of Juanacatlan.

miles	
165.9	Guadalajara (see <i>Gazetteer of Towns</i>), 5,551 ft., junction for Manzanilla (Section XXVIII). In city and vicinity are electric trams, 4 ft. 8½ in. gauge, 31 m. in length.
180.2	La Venta.
198.7	Orendain, 4,730 ft. From this point a railway is being constructed to meet the Southern Pacific system at Tepic (Section I).
215.6	La Vega. <i>Branch line</i> to (6.2 m.) Matute, (8 m.) Romero, and (12.4) Ameca.
227.4	Ahualulco.
236.7	Etzatlán.
244	San Marcos, terminus of line.

XXX.—PUERTO MEXICO—SALINA CRUZ, 188.5 miles
(Tehuantepec National Rly.)

The Tehuantepec National Railway is a reconstruction of a line completed in 1895, after forty-five years of effort to build a transisthmian railroad and the expenditure of some £6,400,000. The existing line proving inadequate for the traffic was rebuilt by Messrs. S. Pearson & Son and opened in 1907.

The shares of the company are held jointly by the Mexican Government and Messrs. Pearson & Son. In 1917 the Carranzist Government took over the line, and legislation was passed authorizing the dissolution of the contract with Messrs. Pearson.

The whole line has been adapted to curves of a minimum radius of 492 ft., compensated, and a gradient of 1.6 per cent., except in the Chivela Pass (see below).

There are 846 bridges and culverts. The culverts are of concrete on the northern division and of masonry on the central and southern divisions. 225 of the waterways are spanned by steel trusses, plate girders, and trestles. In

addition to the large bridges mentioned below there are others having spans between 46 ft. and 98 ft., with lattice half-through girders, and still others with spans between 17 ft. 4 in. and 42 ft. 7 in., with plate deck girders.

The line is of 4 ft. 8½ in. gauge. The ties are creosoted pine, California redwood, and native hardwood. 80-lb. steel rails are used and in addition to the main track there are 60 miles of sidings. The railway is built so that it can be converted into a double-track line. The track is kept clear of weeds and dust by the sprinkling of oil. The road-bed is rock-ballasted.

The average time occupied in a journey from port to port is stated to be 12½ hours up and 10¼ hours down. The capacity of the line is estimated at ten 300-ton freight trains in each direction every 24 hours.

The rolling-stock (1917) is as follows: 57 locomotives, 17 passenger cars, 5 mail cars, 13 cabooses, 43 gondolas, 26 tank cars, 947 box cars, 241 flat cars, 47 stock cars, and 1 steam hammer, 1 steam crane, 3 box cars, 2 flat cars, for wreck outfit.

All engines are oil-burning and freight cars are constructed with movable tops, or hatches.

Traffic was unreliable down to August, 1918, owing to unsettled conditions.

miles

0

Puerto Mexico (see *Gazetteer of Towns*). Gulf terminus of railway. Here are a power house and three steel tanks, capable of storing 1,500,000 gallons of oil, which is distributed to smaller tanks along the line, each of which has a storage capacity of 6,500 gallons. As far as Tolosa line crosses a broad plain on a max. curvature of 11.6 deg., with a max. grade of 1.6 per cent. Line runs W., parallel with coast, to a little beyond m. 8.

8

Rio Chacalapa is crossed by a steel bridge, with five spans of 119 ft. each, plate girders riveted.

10.4

Calzadas.

MEXICO

11

miles

Line now turns SW. and follows r. bank of the Chacalapa to

17 Limones.

18.6 Carmen.

Branch line (F. C. Minatitlan), 4 ft. 8½ in. gauge, to (7.4 m.) Minatitlan, town on the Rio Coatzacoalcos, 20 m. above its mouth. Here is an oil pipe line from San Cristobal, 20 m. distant, and a refinery supplying oil for use on the railway.

47 Almagres, 282 ft.

53.8 El Juile, 154 ft., point of departure for towns on the Papaloapan river. Steel oil tank.

Branch line, 7.4 ft. 8½ in. gauge, to (6.3 m.) Aguilera, and (17.4 m.) San Juan Evangelista, 223 ft., town on the Rio Colorado.

From this point line runs almost due S.

65.4 Tortugas. S. of this station line crosses the Arroyo Naranjo and descends to

78.6 Santa Lucrecia, junction with the Vera Cruz and Isthmus Railway (Section XXV). One steel and one concrete oil tank. Line now crosses the Rio Jaltepec (tributary of the Coatzacoalcos) by a steel bridge, with 5 spans of 119 ft. each, lattice girders, Pratt type. Track describes wide curve and follows river bank for some distance.

89 Ubero. Line reaches small tributary of the Coatzacoalcos, runs parallel with its l. bank, and then crosses river.

96.4 Tolosa. In this neighbourhood commences the ascent to the Chivela Pass and the next 58 m. embrace the crossing of the Cordilleras

98.7 Steel bridge, with 3 spans of 119 ft. each, lattice girders, Pratt type.

109.3 Sarabia. Here is a steel bridge, with one span of 119 ft., lattice girders, Pratt type, and 4 spans of 53 ft. 8 in. each, plate girders, riveted.

miles	
115.8	Mogoñe.
118	Steel bridge over Malatengo Cañon, with 2 spans of 121 ft. 5 $\frac{2}{3}$ in. each, lattice girders, Pratt type. Here, for about 9 m.; is the heaviest construction work on the line.
121.4	Ives.
126.5	Rincon Antonio, 575 ft. Here are the building and repair shops, officials' and workmen's dwellings, one concrete and one steel oil tank, and power house.
129.8	Line enters the Chivela Pass. In the pass the max. grade is 2.07 per cent. and the max. curvature 21.8 deg. Track runs over two horse-shoe curves and through one tunnel, 230 ft. long. The pass extends to m. 153.4 and the descending grade previous to reconstruction was in places as much as 160 ft. to the mile (3.09 per cent.).
132.6	Lagunas. Near this point line reaches an elevation of about 730 ft., and then descends more abruptly to the Pacific.
158.6	Gamboa, junction with the Pan-American Railway (Section XXXI).
159	San Geronimo. Line now runs SSW. to
176.4	Tehuantepec, 125 ft. (see <i>Gazetteer of Towns</i>). Here is one steel oil tank.
180.8	Tehuantepec river is crossed by a steel bridge, with 3 spans of 200 ft. 11 in. each, lattice girders, Pratt type. Line now crosses sandy region and runs SSE. to
188.5	Salina Cruz, Pacific terminus and port. Here are three steel oil tanks and power house (see <i>Gazetteer of Towns</i>).

XXXI.—GAMBOA—SUCHIATE, 284.3 miles
(Pan-American Rly.)

The Pan-American Railway, 4 ft. 8 $\frac{1}{2}$ in. gauge, starts from Gamboa, State of Oaxaca, and runs SE., following, and at

various distances from, the coast, to the Guatemalan frontier. The line traverses a tropical country, somewhat deficient in rainfall at the northern end but with a plentiful supply in the more southerly districts. It passes over numerous waterways, some of which have granite bridges though the majority are of wood, and runs between some of the smaller mountains, keeping close to the coast in order to avoid the numerous barrancas in the coastal ranges, which in places have peaks 6,000 to 7,000 ft. high, less than 15 m. inland.

The Pan-American Railway Company was incorporated in the State of New Jersey in 1901 and the line in Mexico forms part of the larger scheme for a railway connecting North and South America. The railway is worked by the Constitutionalist Railway administration.

The rails (steel) are 56 and 60 lb. There were 10 locomotives and 113 cars in 1911.

miles

0	Gamboa (or Picacho), junction on the Tehuantepec Railway (Section XXX).
10.5	Juchitan, 65 ft. (see <i>Gazetteer of Towns</i>).
23.1	Union Hidalgo, point of departure for the estate known as La Marquesada of Hernando Cortes. Line crosses a broken region and enters the foothills of the coastal range.
38.5	Cerro Loco, for Niltpec, pop. 6,000, on the Rio Niltpec.
49.6	Reforma. Before reaching this station the Rio Ostuta is crossed by a bridge 735 ft. long.
54.7	San Nicolas. Beyond this station line enters State of Chiapas. A few miles NE. lies Tapanatepec, 918 ft.
88.7	La Aurora. About 40 m. N. lies Zintalapa, agricultural centre.
94.4	Jalisco. Hence wagon-road runs to Tuxtla Gutierrez, capital of State of Chiapas. Point of departure for towns of Chiapa, San Cristobal de las Casas, and Comitán.

miles	
108·9	Tonala, pop. 7,000. Here are the head-quarters and shops of the railway. The port (Puerto Arista) lies 9 m. SW. and is connected by a branch line. Beyond Tonala railway runs close to the lagoons and farther on it crosses numerous rivers on steel bridges and passes through a tropical region, with dense forests.
137·3	San Pedro.
163·7	Pijijiapan. The rubber country commences in this neighbourhood and extends almost to Guatemala.
193·8	Mapaxtepec.
211·5	Escuintla.
232·6	Huixtla, centre of coffee plantations.
258·9	Tapachula (see <i>Gazetteer of Towns</i>). For the port of San Benito or Soconusco, some 15 m. S.
266·6	Los Toros.
274·7	Cahuacan. Rio Cahuacan is crossed.
284·3	Suchiate (or Mariscal). Here the Rio Suchiate and the frontier of Guatemala are reached. Line crosses river to Ayutla by an iron bridge and continues through Guatemala, with branch (completed December 1913) from Ayutla to the port of Ocos.

XXXII.—RAILWAYS IN YUCATAN, CAMPECHE, AND QUINTANA ROO

The railways of Yucatan now form a part of the Mexican Constitutionalist Railways, the Government having acquired all the stock of the companies. The system covers not only the State of Yucatan but also extends to the city of Campeche. It has a total length of 530 m.

In 1909 the rolling-stock on the Yucatan railways consisted of 57 locomotives, one automobile for road inspection, one steam motor-car, 90 passenger cars, 26 Pullman cars, 33 cattle trucks, 569 closed freight cars, and 260 open and platform cars.

In 1918 the track was reported in good condition though little cared for, but the rolling stock was badly in need of repair.

In addition large portions of the State of Yucatan are traversed by small narrow-gauge lines, the majority of which are worked by animal traction, bringing the produce of the henequen plantations to the distributing centres. In 1907 there were 1,313 miles of these lines.

miles

(a) *Progreso-Merida*

0	Progreso, port. Two lines run from Progreso to Merida. The first, 3 ft. gauge, leaves the Estacion del Oriente and runs to (14.2 m.) Chicxulub, (19.2 m.) Contral, (21.7 m.) Cholul, and (29.2 m.) Merida (Estacion de San Cristobal). The second (see below) 4 ft. 8½ in. gauge, runs SSW. from the Estacion de la Division del Norte. (See <i>Gazetteer of Towns</i> .)
8.6	San Ignacio.
12.4	Yaxche.
18.6	Chuburna.
20.5	Itzimna.
22.3	Merida, 25 ft., Estacion de la Mejorada (see <i>Gazetteer of Towns</i>).

Tramways are numerous in this district, running to the plantations. Amongst them the following are the more important :

Merida to Tekik (Municipality of Acanceh), 1 ft. 7½ in. gauge, 17.3 m. long ; with a similar line to same place, 15.5 m. long.

Merida to Dzidzilche (Compañia Agricola de Dzidzilche), 2 ft. 6 in. gauge, 15 m. long.

Merida to Copo, 1 ft. 7½ in. gauge, 8.6 m. long.

Merida to Hunucma (see below), 3 ft. gauge, 18.6 m.

Merida to Hunucma (another), 2 ft. gauge, 36 m.

miles

(b) *Merida-Campeche*, 107·2 miles

- 0 Merida (Estacion Peninsular or de Campeche).
Line, 3 ft. gauge, runs SW.
- 9·9 Uman, chief town of the Partido de Hunucma.
Branch line, 3 ft. gauge, runs NW. to (6·8 m.)
Texan, and (13 m.) Hunucma (see above).
- 21 Chochola.
- 31·5 San Bernardo. In this district are the following
tramways (i. a.) :
San Bernardo to Opichen, 10 m. NE. of San
Bernardo, 1 ft. 7½ in. gauge. San Bernardo to
the Hacienda de San Bernardo, 1·8 m., 1 ft. 7½ in.
gauge, with line from the Hacienda, 1 ft. 7½ in.
gauge, to the Hacienda de San Juan, 2 m.
- 36·4 Maxcanu, chief town of Partido de Maxcanu.
Here are numerous tramways, including the following :
Maxcanu to the Hacienda de Calcehtok, 6·2 m.
E. of Maxcanu, 1 ft. 3½ in. gauge.
Maxcanu to the Hacienda de Chenchucmil,
16·7 m., 1 ft. 7½ in. gauge.
- 48·4 Halacho. Here line enters State of Campeche.
- 93·1 Tenabo.
- 107·2 Campeche, port (see *Gazetteer*) capital of State of
Campeche. *Branch lines*—(1) Animal traction, run-
ning SE. to Uayamon (Vallomon) and thence
NW. to Tixmuxe. This line is 74 m. in length
and on a 3 ft. gauge. (2) Another line, 3 ft.
gauge, steam traction, runs (or used to run ?)
5 m. WSW. to Lerma.

(c) *Merida-Acanceh-Peto*, 93·9 miles

- 0 Merida, 25 ft. (Estacion de Peto). Line, 3 ft.
gauge, runs SE. to Acanceh, thence S. to Ticul, and
SE. to Peto.
- 8·6 Tehuiz.

miles

15.5

Acanceh, chief town of the Partido de Acanceh and important distributing centre. *Tramways* numerous, including the following :

Acanceh to Uayalceh (Municipality of Abala), 19.2 m. SW., 1 ft. 7½ in. gauge. From Uayalceh there is a line, same gauge, to (7 m.) Sotuta (see below).

Acanceh to Chunkanan (Municipality of Cuzana), 14.2 m. SE., same gauge. From Chunkanan there is a line, same gauge, to (11.1 m.) Homun, whence there is a line, 9.3 m. long, from San Isidro to Isincab, 2 ft. 5½ in. gauge.

Branch line, 3 ft. gauge, runs from Acanceh SE. to Sotuta, through (6.2 m.) Seye, (9.9 m.) Xuku, (14.2 m.) Hocaba (whence there is a branch—*Tranvia Vecinal de Yucatan*, ? 3 ft. gauge, to (4.3 m.) Hochtun, (7.4 m.) Dzhuiche, and (12.4 m.) Cacalchen, station on line from Merida to Izamal), (27.3 m.) Kankabconot, and (35.4 m.) Sotuta. In connexion with this branch there are numerous tramways, including the following :

Seye to Nohchan, 12.4 m. 1 ft. 7½ in. gauge.

Nohchan, 6.2 m. long, same gauge.

Ticopo, 3 m. N. of Seye, to (2.4 m.) Uitza, to (2.4 m.) San Bernardino, to (2.4 m.) Tixpehual, and to (7.4 m.) Tixpehua, all 1 ft. 7½ in. gauge.

Ticopo to Motul (on line to Valladolid), 3.1 m., 2 ft. gauge.

Holactun, 5 m. NE. of Seye, 7 m. long, 1 ft. 7½ in. gauge.

Xuku, 10 m. long, 1 ft. 7½ in. gauge.

Sotuta : Hacienda de Tixcacal, 15 m. long, 1 ft. 7½ in. gauge ; and Hacienda de San Juan, 15.5 m. long, same gauge.

miles	
20.5	Tecoch. <i>Tramways</i> numerous, including the following : Yaxcopol, 12.4 m. long, 1 ft. 7½ in. gauge. Sabache, 8.6 m. long, same gauge. Pixyab, 3.7 m. long, same gauge. Lepan, 12.4 m. long, same gauge.
23.6	Lepan.
28.5	Xcanchacan. <i>Tramways</i> , two, 5 m. and 6.2 m. long respectively, 1 ft. 7½ in. gauge.
45.3	Ticul, chief town of Partido de Ticul. Here there is a line through Muna to Merida (see below).
65.8	Tekax, chief town of the Partido de Tekax.
84.4	Tzucacab. <i>Tramway</i> , 1 ft. 7½ in. gauge, to (11 m.) Catmis.
93.9	Peto, chief town of the Partido de Peto.

(d) *Merida-Temax-Valladolid*, 112 miles

0	Merida, 25 ft. (Estacion Peninsular). Line, 3 ft. gauge, runs N. to Conkal, thence SE. to Tixkokob, thence NE. to Temax, and thence SE. to Valladolid.
7	Cholul. <i>Tramway</i> , 1 ft. 7½ in. gauge, to (5 m.) Hacienda de Cholul.
10	Conkal. <i>Tramways</i> numerous, including the following : Conkal to Tecat and Mococho, 1 ft. 7½ in. gauge, 6.8 m. long. Conkal to Kuche, 1 ft. 7½ in. gauge, 9.3 m. long. <i>Branch line</i> (Tranvia Vecinal de Yucatan), 3 ft. gauge, to (8.6 m.) Villa de Baca.
19	Tixkokob, chief town of the Partido de Tixkokob. <i>Tramways</i> numerous, including the following : Tixkokob to Katanchel, 1 ft. 7½ in. gauge, 7 m. long. Tixkokob to San Antonio, same gauge, 7 m. long.

miles

	Tixkokob to Kankabchen, same gauge, 10 m. long.
22.4	San Juan Koop. <i>Tramway</i> to Euan on line to Izamal.
28.4	Motul, chief town of the Partido de Motul. <i>Tramways</i> numerous, including the following : Motul to Dzemul, 2 ft. gauge, 12.4 m. long. Motul to Ticopo, on line to Sotuta, 2 ft. gauge, 3.1 m. long. Motul to Santa Teresa, 1 ft. 7½ in. gauge, 6.2 m. long.
41.5	Cansahoab. <i>Tramway</i> , 1 ft. 7½ in. gauge, 6.2 m. long.
52.1	Temax. <i>Tramway</i> , 1 ft. 7½ in. gauge, 11 m. long.
87.4	Citas.
89.4	Empalme Linea de Tizimin. <i>Branch line</i> , 3 ft. gauge, runs NE. to (18.6 m.) Espita, and (36 m.) Tizimin. It is reported that this line has been carried on about 12 m. beyond Tizimin, in the direction of the coast, and there appears to have been some construction from the coast inland : (a) from Chicilo to (7 m.) Solferino ; (b) from Yalahan to (6 m.) Solferino, where there is a machine shop ; (c) a line in construction from Solferino to (10 m.) Nuevo Leon ; (d) a line from Nuevo Leon to (8 m.) Moctezuma ; (e) a line from El Cuyo on the coast to (7 m.) Moctezuma ; (f) a line from Moctezuma for about 12 m. in the direction of Tizimin. There are no details, however, concerning these lines between Tizimin and the coast, and the above statement must be received with caution.
112	Valladolid, chief town of the Partido de Valladolid.

miles

(e) *Merida-Izamal*, 41·6 miles

- 0 Merida (Estacion de Peto). Line, 4 ft. 8½ in. gauge, runs E. and SE. to Izamal.
- 12·4 Tixpeual. *Tramway*, 1 ft. 7½ in. gauge, to (8·6 m.) Cuca ; and a similar line 6 m. long.
- 15·5 Tixkokob, also station on line to Valladolid.
- 18·6 Euan. *Tramway*, 1 ft. 7½ in. gauge, to (6 m.) San Juan Koop, on line to Valladolid ; and a similar line, 7·4 m. long, to other plantations.
- 41·6 Izamal, chief town of the Partido de Izamal.
- Tramways* numerous, including the following :
 Izamal to Balantun, 2 ft. gauge, 8 m. long.
 Izamal to San Juan, Tecoch, and Yuxche, 1 ft. 7½ in. gauge, 8·6 m.
 Izamal to Chen and Tzalamcab, 1 ft. 7½ in. gauge, 6·2 m. long.

(f) *Merida-Ticul*, 49·7 miles

- 0 Merida (Estacion Peninsular). Line, 3 ft. gauge, runs S. to Muna, and thence SE. to Ticul.
- 11·8 Molas.
- 20·5 Temozon. *Tramway*, 1 ft. 7½ in. gauge, 12 m. long.
- 27·9 Yuncu. *Tramway* to (7 m.) Sacalum, 1 ft. 7½ in. gauge.
- 36·6 Muna. *Tramway* to Yaxcopol, 1 ft. 7½ in. gauge, 8 m. long.
- 49·7 Ticul, chief town of the Partido de Ticul. Here is the line from Merida to Peto (see above).

(g) *Quintana Roo*

In the territory of Quintana Roo there are (or were) two small lines, viz. from Vigia Chico to Santa Cruz de Bravo, steam, 2 ft. 11 in. gauge, 35·4 m. in length, and from Xcalak to La Aguada, animal

miles

traction, 2 ft. 11 in. gauge, 16 m. long. In the Puerto Morelos district there are three short lines, animal traction, 1 ft. 7½ in. gauge, 7·4 m., 1·8 m., and 38·5 m. respectively, the last connecting the quay with the head-quarters of the company which works the forest produce of the locality.

XXXIII.—RAILWAYS IN LOWER CALIFORNIA

Numerous concessions have been granted for railways in Lower California and there is a project for connecting the port of Ensenada with the railways in the United States.

The following short lines are in existence :

1. A branch of the Southern Pacific Railway, 4 ft. 8½ in. gauge, from Los Angeles, California, to Yuma, Arizona. This branch built to serve the irrigated Imperial Valley leaves the main line at Imperial Junction and crosses the Mexican border from Calexico, U.S.A., to Mexicali and passing through (18 m.) Cocopah, (23 m.) Hechicera, and (38 m.) Paredones, leaves Mexican territory near (53 m.) Andrade, 9 m. from Yuma near which place it rejoins the main line of the Southern Pacific Railway.

2. From San Quentin, where is a settlement of the Lower California Development Company, there is a private line, 3 ft. gauge, running N. for 16·7 m. to San Ramon.

3. At Santa Rosalia, the Boleo Company (French) have a line, 3 ft. gauge, 26·7 m. long, connecting with their copper mines.

XXXIV.—MEXICO TRAMWAYS COMPANY

In 1906 a company formed under the laws of the Dominion of Canada, with head office at Toronto, took over the existing tramways around Mexico City. In 1916 the Company owned 208 m. of lines, of which 193 m. were electric tramways. The following are the principal places served by these lines

in the Federal District with their distances from Mexico City :

<i>Place.</i>	<i>Distance in miles.</i>
Xochimilco	14·4
San Angel	9
Coyoacan	10·9
Tlalpan	10·9
Tacubaya	5
Mixcoac	7·1
Cualyimalpa	14·4
Guadalupe	4
Piedad	3·5
Atzacapotzalco	6·2
Tacuba	4·3
Ixtapalapa	7·6
Mixcoac	7·2
Tizapan	10
Tulyehualco	6·8

XXXV.—TRAMWAYS IN TABASCO

In the State of Tabasco are the Tranvias Tabasqueños. A short line runs from San Juan Bautista, the capital (see *Gazetteer of Towns*), to (4 m.) Rio Gonzalez, animal traction, 3 ft. gauge. A similar line runs to El Playon. A third line (Linea Urbana de la Compania Industrial de Transportes), animal traction, 2 ft. 5 in. gauge, 4 m. in length, runs from San Juan Bautista to various suburbs. A fourth line, animal traction, 3 ft. gauge, runs to Alasta and Paso del Carrizal, 4 m. A fifth line, animal traction, same gauge, runs to (3·7 m.) Nacajuca. There are numerous other tramways in the State.

There is a light railway (F.C. Villa Cardenas al Rio Grijalva ; ? animal traction) from Cardenas to (3·7 m.) Paso Real (Grijalva), a point on the Grijalva River about 50 miles above (west of) San Juan Bautista.

APPENDIX IV

GLOSSARY OF TOPOGRAPHICAL TERMS,

WORDS COMMONLY USED IN PLACE-NAMES, &c.

abrigo	shelter	arrecife	reef
adobe	a sun-dried brick	arroyo	rivulet
aduana	Custom house	asiento	mining district
agua	water	astillero	dockyard
aguas	neap tides	atalaya	watch tower, elevated place
muertas		avenida	avenue
aguas vivas	spring tides	azufre	sulphur
aguacate	alligator-pear	azul	blue
aguada	watering place	azulejo	blue and white tile
aguaje	tidal water		
águila	eagle		
aguja	needle	bahía	bay
akalché	a depression or basin which after rain is changed into a lake	bajada	descent
		bajo, -a	low, shoal
		balsa	raft
		baluarte	bulwark
		baratillo	market, shop
ahumado, a	of smoke, smoky	barra	bar at the mouth of a river or harbour
álamo	poplar		
albarrada	trench	barranca	deep gully
albufera	tidal lake	brarranquita	small barranca
aldea	small village	barrio	suburb, district of a town
alfaque	sandbank		
algodón	sand dune in S. California	blanco, -a	white
altillo	hillock	boca	mouth, opening
alto, -a	high, tall	boca costa	'mouth of the coast,' or place where the tran- sition from the hot lowlands of the coast to the cold uplands is clearly percep- tible
amarillo, -a	yellow		
ancho, -a	broad		
angostura	narrow pass		
árbol	tree		
arena	sand		
arenal	sandy ground		
armería	arsenal		
arrabal	suburb		

boquilla	small opening	carbonera	charcoal pit
bolsón	shallow valley of internal drainage	carrizal	land overgrown with reeds
buenavista	fine view	casa	house
buenó, -a	good	cascajo	gravel
cabello	hair	caserio	series of houses
cabeza	head, top	castañedo	chestnut grove
cabezo	summit of a hill	castillo	castle
cabo	cape or headland	cedro	cedar
cala	creek or small bay	cerrillo	small hill
calavera	skull	cerro	hill
calera	lime-kiln	chaparral	stony tract covered with bushes
caleta	cove	charco or charca	pool, standing water
caliente	hot	chico, -a	small
callejón	passage, alley	chiquito	very small
camino	road, track	chorro	water spout
camino car- retero	carriage road	ciénega	swamp
camino de herradura	horse track	cinco	five
camino de hierro	railway	ciudad	city
camino de ruedas	cart road	cofradía	union, associa- tion
camino real	highway	colorado, -a	red
camino vecinal	country road	comisaría	military post (?)
campanario	belfry	congrega- ción	congregation, religious com- munity (?)
campo	field	coronilla	top, crest
caña	reed	corral	farm-yard, cattle-pen
cañada	valley	correo	post (office)
canal	channel or strait	crucita	small cross
canoa	canoe	cruz	cross
cañón	deep valley	cuadrilla	hamlet
capilla	chapel	cuatro	four
carabineros	a post of mili- tary coast- guards	cuesta	slope, declivity
capulín	kind of cherry	cueva	cave
		cumbre	top, summit
		cumbre	steep ridge
		salida	

dique	dock, dike	gacho, -a	bent
dos	two	garganta	mountain gorge
durazno	peach-tree	garita	look-out house
		golfo	gulf or bay
		gordo, -a	fat, large
encina	evergreen oak	grande, gran	large
encinilla	small oak-tree	gris	grey
enramada	hut of branches	grao	strand, shore
ensenada	bay or creek	guage, guaje	calabash
ermita	hermitage		
escollo	rock under shallow water	hacienda	landed estate
escalera	steps, ladder	higuera	fig-tree
escondido, -a	hidden, concealed	hondo, -a	deep
		hueco, -a	hollow
estancia	mansion, dwelling	huerta	orchard
estanque	pond	iglesia	church
estero	tidal creek, estuary	imagen	image
estrecho	strait	isla	island
		isleta	islet
		jara	place overgrown with rock roses or prickly bushes
fábrica	workshop, factory	junta	junction
fanal	lighthouse		
fango	mud	labor	plot of ground, small farm
ferrocarril	railway	lago	lake
finca	in Mexico, a small estate or farm; in Guatemala, a large estate or coffee plantation	laguna	lagoon, lake
		lagunita	small lagoon
fondeadero	anchorage	laja	flat rock
fragua	smithy	lápiz	graphite
fresno	ash-tree	leche	milk
frio, -a	cold	lechería	dairy
frontera	frontier	limo	mud
fuelle	fountain,	limón	lemon
	spring of water	llano	plain
fuerte	fort	loma	rising ground, low ridge
		lugar	place, village, small town

maíz	maize	oscuro, -a	dark
malecón	dike, quay	ojo de agua	water-hole
mal paso	difficult pass	ojuelo	small (water) hole
mar	sea	órgano	tall cactus
marea	tide	oro	gold
mata	thicket, wood	ovejuna	sheep farm
matancilla	small slaughter-house	pabellón	tent, flag
matanza	slaughter-house	palacio	palace
medio, -a	middle	palizada	palisade
meridional	southern	palma	palm-tree
mesa	tableland	palmar	grove of palm-trees
mesilla	small plateau	palo	stake, stick
mescal	maguey wine	parada	halt
mesón	inn	paraje	place, locality
milpa	maize field	pardo, -a	grey
milpilla	small maize field	paredón	thick wall
mimbre	osier	parra	vine
mina	mine	paso	mountain pass
mineral	mine	peaje	toll
molino	mill	pedernal	flint
montaña, monte	mountain	pedregoso, -a	stony
mora	mulberry	peña	rock or large stone
moral	mulberry-tree	peñasco	large rock
muelle	mole or jetty	peñón	rock or rocky mountain
muralla	rampart, wall	pié	foot
naranjo	orange-tree	picacho	summit
negro, -a	black	pico	peak
nevería	ice-house, drinking shop	piedra	stone, rock
nieve	snow	pino	pine-tree
nogal	walnut-tree	plátano	plane-tree
nogalito	small walnut-tree	platanito	small plane-tree
nombre	name	playa	beach
noria	water-wheel	poniente	west
norte	north	posta	post, relay
nuevo, -a	new	potrerillo	small horse ranch
nuez, <i>pl.</i>	nut	potrero	horse ranch, pasture land
nueces			

pozo	well	saco	bay
pozuelo	small well	salado, -a	salt
presidio	penal settle-	salina	salt spring,
público	ment		saltpan
prieto, -a	black	san, santo,	saint
pueblo	village	santa	
pueblito	small village	sanidad	health
puente	bridge	saucedá	willow grove
puente col-	suspension	sauz, <i>pl.</i>	willow
gante	bridge	saucés	
puerco, -a	foul	seco, -a	dry
puerta	door, gate	seda	silk
puerto	harbour, defile	seno	gulf or bay
punta	point, headland	septen-	northern
		trional	
quemado, -a	burnt	sierra	mountain range
quesera,	dairy	siguanes	deep crevasses in
quesería			the soil
quinta	country house	soledad	solitude, desert
		sud, sur	south
ramada	<i>see</i> enramada		
ranchería	ranchos, or group	teja	tile
	of ranchos	temporal	storm
ranchito	small rancho	tenería	tanyard
ranchos	farm, hut	terral	land wind
real'	royal	tiempo	weather
redondo, -a	round	tierra	earth
refugio	asylum	todo, -a	all
relleno	filling, cause-	torre	tower
	way	torrecilla	small tower
ría	the mouth of a	tranca	barrier
	river	trapiche	sugar-mill
ribera	the shore, the	tres	three
	bank of a river	troje	granary
rincón	corner	turbio, -a	muddy
río	river		
risco	steep rock	vado	ford
roca	rock	valle	valley
rojo, -a	red	vallecillo,	small valley
		vallecito	
sabana	savanna, exten-		
	sive plain		

vara	pole, perch	vigía	a look-out,
vega	meadow, field		doubtful shoals
venadero	deer haunt	villa	town
venta	poor inn, shelter	virey, virrey	viceroy
verde	green		
vero, -a	true	yerba	grass
vértice	vertex		
viejo, -a	old	zarco, -a	clear, pure

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NOTE.—The general map of Mexico in the case accompanying this volume is intended mainly to illustrate the relief and other physical features, territorial divisions, &c. As it dates from 1909, its representation of the railway system should be supplemented by the use of the special map of the railways.

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